A Database Publication

THE MICRO USER

Volume 8 Number 5 July 1990 £1.50

GAMES MEGA ISSUE

HOW IT'S DONE
A top games writer reveals his secrets

EXPANSION
DIY board doubles your memory

SCROLLING
New technique = more power

PATIENCE
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Hawk V9
New Fonts
Primary Power
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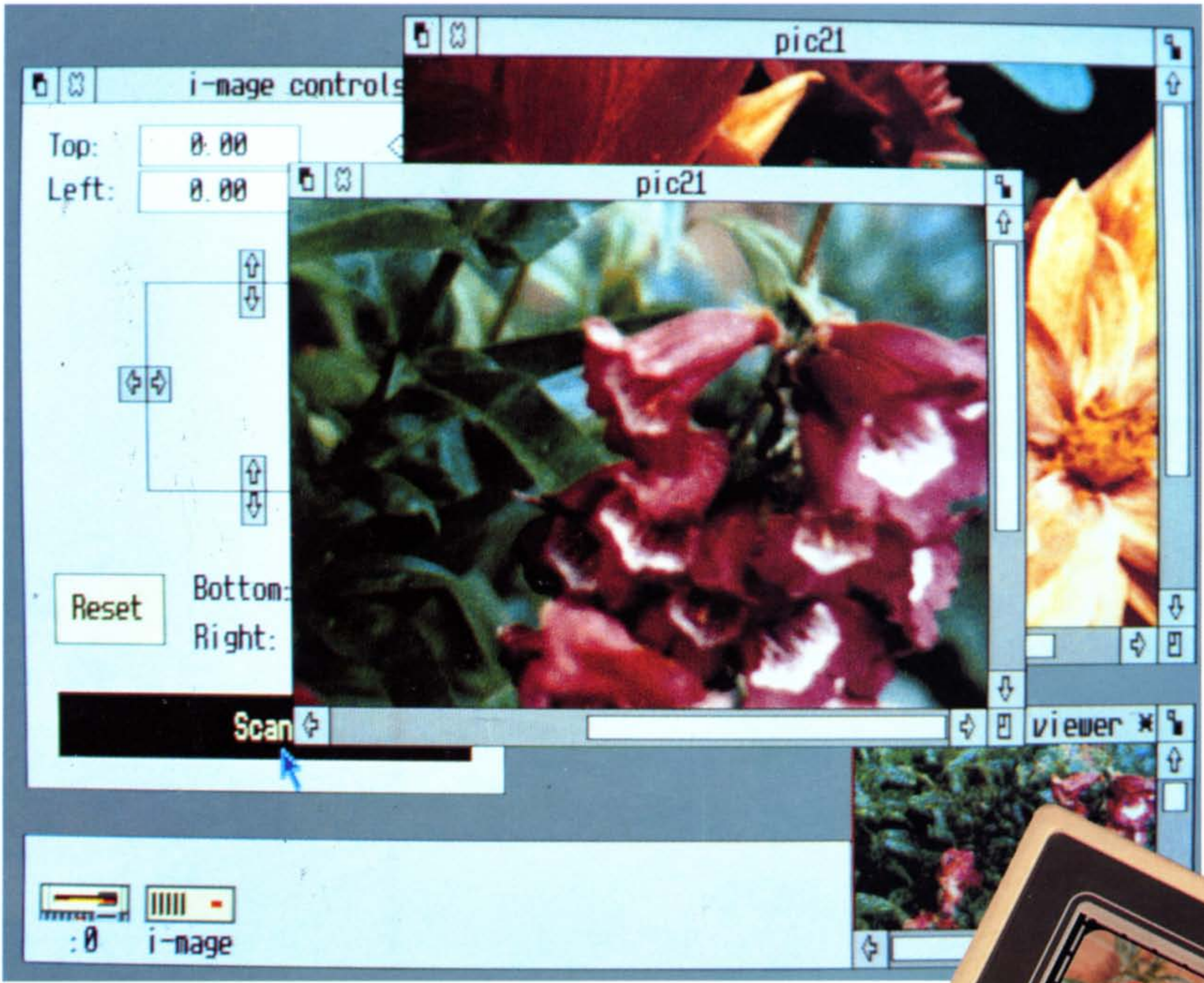
9 770265 404004

Top-selling guide to the BBC Micro, Master, Archimedes series and A3000

The Application of Colour



Top: 0.00
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F=FOUNDATIONS (4)
S=STOCK
QUEEN
1
2
3
4
W=WASTE
D=Deal
EMPTY
From:
1
Lives=3
Lvl=1

SPECIAL

Type-it-in

This symbol indicates that the feature contains at least one full length listing for you to key in on your micro. *

Get it right ✓

All the major listings in this magazine are accompanied by checksums to help you key them in correctly. For full details of how to use them see the article on page 72 of the February issue.

MICRO USER CLASSIFIEDS

The best bargains in the world of the BBC Micro come from fellow readers of The Micro User. Turn to Page 106 to find just what you're looking for – from cheap modems to complete computer systems.

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Now you can add up to 64k of additional memory to your BBC Micro or Master.

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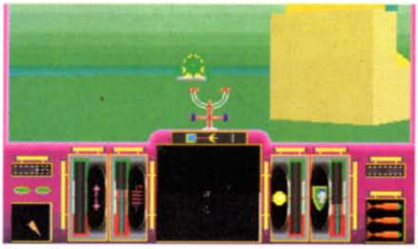
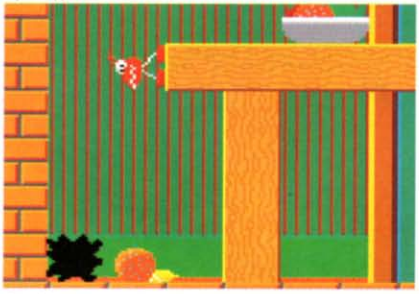
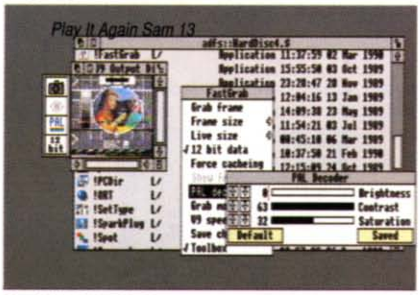

Apocalypse


Bug Hunter

BARBARIAN II
© 1989
SELECT
1
2
©1988 SUPERIOR
©1988 PALACE
CONVERSION BY
PETER SCOTT
Play It Again Sam 13


Play It Again Sam 13
adfs::HardDisc4.$
!FastGrab
V9 Output
PAL
12 bit
Application 11:37:59 02 Mar 1990
Application 15:55:50 03 Oct 1989
Application 23:20:47 20 Nov 1989
12:04:16 13 Jan 1989
14:09:38 23 May 1989
11:54:21 03 Jul 1989
08:45:10 06 Mar 1989
10:37:50 21 Feb 1990
FastGrab
Grab frame
Frame size
Live size
√12 bit data
Force cacheing
√Toolbox
!PCDir
!ORT
!SetType
!SparkPlug
!Spot
PAL Decoder
0 Brightness
63 Contrast
32 Saturation
Default
Saved
Hawk V9 Video Digitisers

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For the price of just one year's subscription just look at what you get: Twelve issues of the best magazine for the BBC Micro, Master series, Archimedes and BBC A3000 plus the monthly disc containing all the listings plus regular extras and public domain software
– ***See Page 100***

THE MICRO USER
THE MICRO USER

What you'll find on this month's disc or tape:

- All the listings from this issue.
- The complete Slides database file.
- The finished 8 bit Desktop system.

Especially for the Archimedes series and BBC A3000 only:

- Full Bouncers II game listing.
- Ultima for the 32 bit machines
- Plus PD applications.

Take out a subscription NOW by filling in the form on Page 100

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THE MICRO USER

Music Mania

In our special music issue NEXT MONTH look out for our overview of the software and hardware available. Not forgetting all our regulars and the great money-saving PD Page.

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Ovation: Introduction

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- Linkable text frames
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- Manual and auto hyphenation (requires 2Mb)
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News BEAT

Big Acorn push in Oz good for developers

ACORN Computers is embarking on ambitious expansion plans which will consolidate its position in the global marketplace and is also good news for many independent software and peripheral developers in the UK.

In his first major public statement since taking over as managing director, Sam Wauchope has announced important moves which are the result of two years' preparation.

As part of its continuing programme of international growth, the company is to establish its own marketing and sales operation in Australasia.

The new development follows a fact finding visit to Australia by managing director Sam Wauchope, who used the occasion to meet major existing customers.

As a result of this, Acorn plans to acquire its existing distributor Barson Computers Australasia Ltd and its subsidiary Barson Computers in New Zealand.

Sam Wauchope.."Opening up new business possibilities"

As ***The Micro User*** went to press, a formal bid had just been made for Barsons which is listed in the main board of the Australian Stock Exchange in Melbourne. The bid price of A$0.05 a share amounts to a purchase price of A$585,000 or £268,350. The bid was conditional on Foreign Investment Review Board approval and acceptance by at least 90 per cent of Barson's shareholders.

Wauchope said: "Australasia has always been important to us and by this action we are underlining our commitment to our existing customers as well as opening up new business possibilities.

"The time is right and the market is right for us to establish a direct presence and we see this as a way of gaining the growth we are looking for from this very exciting market.

"Acorn has spent the last two years getting itself ready to expand. We have great products for a range of customer needs, we have a strong management team and the backing of our major shareholders.

"Acorn saw the opportunity to expand in Australasia some

Turn to Page 9

Banish board bugs

HELP is to hand for BBC Micro owners who own a Solidisk 32k, 2/4M board but are troubled by the bugs in its software.

Richard York of Narborough and seven other owners of such boards have spent the last few months totally rewriting the software to remove many of the bugs and add extra features. The board was the last product for BBC Micros from STL.

"Our software turns the board into an extremely good piece of hardware and totally transforms its use", says Richard. "We have also devised a method of adding as much extra ram to the board as you want which the software fully recognises and uses.

"I would like to appeal to any owners of the 32k 2/4M boards to contact me so that I can let them have a copy of the new software, since there are many owners of these boards who I have so far been unable to contact. If they will get in touch with me I will be able to help them out".

Anyone wanting to take Richard up on his offer can contact him at Upperlands, Milton Street, Narborough, Leicester, LE9 5EZ or ring 0533 867926.

A3000 video adaptor

PINEAPPLE Software (081-599 1476) has produced an add-on adaptor box to allow its Video Digitiser to work with the Acorn A3000.

The box connects to the A3000 using a ribbon cable and contains the necessary 12 volt mains power supply. It costs £74.75 and when used with it, the digitiser achieves identical performance to that obtained with larger computers.

It's Alice in Arcland

WHEN he wrote the childrens' classic Alice in Wonderland, little could Lewis Carroll have believed that it would one day be computerised. It has been, as a spin-off from the recent licensing agreement between Magnetic Scrolls and Virgin Mastertronic (071-727 8070).

Talented programmer David Bishop of Magnetic Scrolls puts players in the role of Alice with the objective of living out her dream and exploring every part of Wonderland, meeting its inhabitants and solving puzzles along the way.

With excellent graphics providing more than 100 illustrations, Wonderland is due out for Archimedes machines later this year and features Magnetic Windows, a radical new adventure environment developed by Magnetic Scrolls.

It includes the well loved characters of the book in their original settings. Price to be fixed.

Cashpack

CAST 1 is a new computerised cashbook package for the Archimedes from Soft Rock Software (0272 503639). Allowing for up to 32 automatic and 224 manual entries a month, it costs £29.95.

The Latest 2 Magazines

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RISC User

The most popular magazine devoted solely to the Archimedes range of computers and the new BBC Micro – the A3000.

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Genesis
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Risc User offers 10 magazines a year, which typically contain:

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Ready to run applications
Hardware articles
Programs and articles on sound and graphics
Postbag for your letters and answers to your questions
Hints and tips on programming
Technical queries and expert answers

The programs published in each magazine, plus additional bonus items are also available on disc.

And here are some of the articles and series you missed in the last few months:

Mastering the Wimp – series on Wimp programming
Beginning 'C' – series on the C language
Assembler Workshop – all about ARM Assembler
Under the Lid – hardware series
CD ROM for the Archimedes
Watchdog Anti-virus
Using Draw Files in Basic
Desktop File Loader
Review of Multi-sync Monitors
Scanners for the Arc
PSION and Z88 to Arc
Into the Arc – series for beginners
Arcade – latest games for the Arc

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Practical Assembler – series for Assembly language programmers
512 Forum – a series for users of the PC emulator
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Open day is an opening for youngsters

Interesting visitors at the Open Day

NEEDY youngsters in Watford are to get their first taste of computing thanks to the efforts of the publishers of *The Micro User*, Database Publications and top Acorn dealer Watford Electronics.

At the Watford Electronics Spring Open Day cash was donated by visitors in return for back copies of *The Micro User* and copies of the title's cover discs.

The aim was to provide a computer for Watford's Get Set Community Centre, which caters for unemployed youngsters, under-privileged children and handicapped people.

Seventy pounds was raised and the difference will be made up by head of Watford Electronics, Nazir Jessa, to provide the centre with a new BBC Master.

Manager of the centre, Ervin Lewis was thrilled by the news. "We are in desperate need of a computer. We will use the new machine to introduce the younger children to using computers, to give the older ones a better chance of finding a job and for administration of the centre", he said.

Despite the warm weather, 900 visitors turned up at Watford Electronics' headquarters for this fourth Open Day. A new feature was a special education area which attracted much interest from both educationalists and parents. During the day, 30 units of Acorn's new education package The Learning Curve were sold. Staff of *The Micro User* were on hand to meet visitors.

Software houses showing their latest products at the event included Computer Concepts, Minerva, Colton Software and Silicon Vision. Among the guests were chairman of Database Publications, Derek Meakin and Sue Wall of Acorn Computers.

3D design in mind

INTERACTIVE animation, photo-realistic rendering and animations are just some of the features of SolidTools from Silicon Vision (081-861 2173) claimed to be the first fully integrated environment for 3D CAD.

It has been developed to take Archimedes machines to new heights of design productivity and performance which can even exceed heavyweight packages on PCs.

Aimed at architectural, engineering and interior design users, it adopts the industry standard first and third angle projection technique for drawing simultaneously in plan, front and side elevations together with 3D projection to view the design from any angle.

Price, £275.

Also new from Silicon Vision is OfficeTools for office automation and computer controlled presentations. It includes database management, word processing, mail merging, label printing, accounting ,and order processing and share portfolio management facilities. Price, £295.

Make managing your money a real pleasure

DESIGNED with the purposes of "making home accounting a pleasure", Personal Accounts is the latest offering from Apricote Studios (035478 432).

It allows users to analyse their income and expenditure, produce lookalike bank, credit card and building society statements and prepare complete breakdowns of cash transactions.

Personal accounts has only one main entry page which incorporates all transactions so that balances and assets can be seen at a glance and mistakes in statements can be easily discovered. It allows for 48 income and payment headings, 20 standing orders or direct debits and 10 bank or other accounts.

Versions are available for Archimedes machines and all BBC Micros. Price £14.95.

Acorn goes for gold

LOOKING to recruit new value added resellers and increase its share of the professional and business markets, Acorn has announced a Gold Bond Value Added Reseller Scheme.

Launched at the Which Computer? Show, it offers technical backup including equipment loans, hot-line telephone advice and advanced development information.The scheme provides help with distribution channels in the UK and internationally.

It is being backed by a series of VAR conferences which will start in the autumn and regular newsletters published by Acorn.

"Acorn will have to work closely with specialist VARs if we are to achieve the growth targets we have set ourselves in the professional and business markets for the 1990s", said Warwick Hirst, sales and marketing manager for value added products.

From Page 7

time ago. Acquisition of Barsons would allow us to capitalise on the good work that it has done since 1983 in building up a distribution infrastructure and excellent dealer network. Our concentration will then be very much on the needs of our customers.

"We are also keen to market the expertise of the many independent software and peripheral developers in Australia, New Zealand and the UK to a larger customer base and to facilitate a multi-way flow of information and business between users in many countries".

The education market will be one of the major thrusts of this new move since Acorn is now the only computer manufacturer whose products are recommended by all Australian state education authorities.

"Products based on Acorn's own powerful yet low-cost Risc technology are demonstrating their capability to undertake tasks that machines based on other technologies simply cannot perform cost-effectively", added Wauchope.

"We now want to see Australasian computer expertise exploiting that technology to the full. The establishment of a direct presence will be good for Acorn. I am sure that it will also be good for our existing customers and those who have needs for which our products offer cost-effective solutions".

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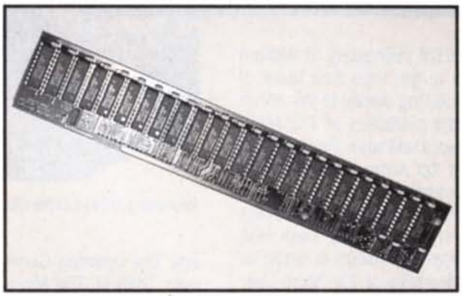

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☐ 1 Mb expandable to 3Mb by the user
☐ Uses latest surface mount technology
☐ Free fitting (by appointment) if required

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☐ Connector for BBC-type 5.25" & 3.5" drives On board switches allow drive mapping to be changed. eg. The internal drive could be made drive 1, and an external drive as drive 0 - ideal for the PC emulator
☐ Whole interface contained on an internal card
☐ Easy to fit, supplied with full instructions
☐ Will work with most drives that have an internal Power Supply Unit.
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☐ Internal and external drives can be set to double stepped
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☐ Optional SCSI interface available

0135	**A3000 buffer**	**£39.95**

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Please note, A3000 users will require the A3000 serial chips.

☐ Transfer in both directions
☐ WIMP driven, easy to use software
☐ Compatible with both DFS and ADFS files
☐ Includes software, 3m cable and instructions

0796	**Serial Link Kit**	**£15.79**

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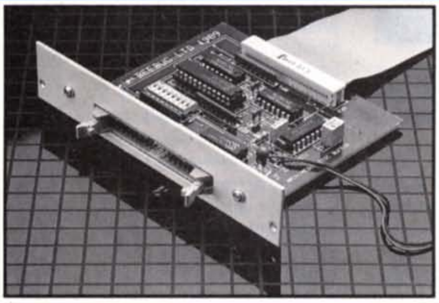

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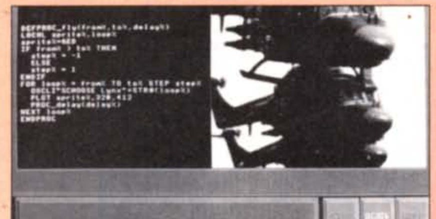
All these BEEBUG hardware products are available from your local dealer.

The Archimedes goes off to war

ARTILLERY fire in battle needs a forward observer to direct the guns which are often attacking targets 10 to 15 miles away. It is a precise and vital military skill which calls for stringent training and many of the soldiers who carry it out have received that training on an Archimedes.

They were using just one of many military and civil training packages based around the Archimedes by Westland System Assessment, an independent consultancy which specialises in sea and land-based defence analysis, tactics and logistics support.

From its Yeovil base the company advises on training programs and provides training systems for virtually anything but much of its work is carried out for its parent company Westland Helicopters.



```
DEFPROC_fly(from%,to%,delay%)
LOCAL sprite%,loop%
sprite%=&ED
IF from% > to% THEN
  step% = -1
  ELSE
  step% = 1
ENDIF
FOR loop% = from% TO to% STEP step%
  OSCLI"SCHOOSE Lynx"+STR$(loop%)
  PLOT sprite%,320,412
  PROC_delay(delay%)
NEXT loop%
ENDPROC
```

In the box to the left of the picture you can see the code needed to create the animation.

Helicopter procedures learned the Archimedes way

"Basically, we are doing two things with the Archimedes", said the head of the company, Dave Wright. "We are producing low cost procedure trainers for use by military people and computer-based training where a student works through a tutorial program".

Using the power and Risc OS architecture of the Archimedes, the company produces colour animations to simulate real equipment. This is combined with digital audio for high fidelity reproduction of sound effects.

One such package is the Sea King Mk42b cockpit procedures program which takes a beginner through the various functions involved in a port engine start and shutdown on the helicopter.

Video clips are used to demonstrate the procedure and the pilot's commentary is given by digital audio.

Having watched the video, the trainee uses a graphic representation of the cockpit consoles on the Archimedes to copy the routine. If it is not copied accurately, the computer runs the program again.

Super new spreadsheet revealed

ACORN has developed a new spreadsheet program specifically for use with Archimedes and A3000 Risc OS-based computers.

Called Schema, it is designed to support the most sophisticated aspects of Risc OS. In addition to normal features associated with spreadsheet applications, Schema supports advanced statistical and financial features and provides accurate control over output, including a fully wysiwyg display. It can be tailored to the user's specific needs with an extensive macro programming language.

With maximum spreadsheet size of 32,000 columns by 32,000 rows, Schema includes a wide range of charts, is fully integrated with other RISC OS applications and includes extensive printer support. Schema should be available in the near future with the price yet to be fixed.

Micro shows Mac the way

A HANDY package which uses the BBC Micro as a link between an Apple Macintosh and a standard Epson printer has been launched by Point Technologies (0923 54316).

It allows Mac users who also have a BBC Micro but do not want the expense of buying a Mac-compatible printer to achieve clear printouts from a 9 pin dot matrix machine.

A lead supplied with the two disc package connects the Mac and BBC Micro via their serial ports.

When loaded, the program essentially turns the BBC Micro into a printer driver by converting the control sequences into standard FX80 codes. The package costs £29.95.

Audiogenic decides to board the Arc

WHILE continuing to support the BBC Micro market, Audiogenic (081-861 1166) is to branch out with its first games title for the Archimedes later this year. Spokesman Peter Carver said it should be ready for September.

ZCL deal signed

ACORN Computers has signed a major distribution deal with fast-growing UK distributor ZCL which has more than 1,000 dealers across the UK. The alliance is designed to hit key target markets outside Acorn's traditional customer base and increase the company's High Street presence.

Pictured after signing the deal are Acorn's sales and marketing director Mike O'Riordan (left) and chairman of ZCL, Don Carter.

Talking it over with Lisp

THE growing popularity of the Common Lisp advanced programming language was underlined at Europal, the first European conference on the practical applications of Lisp held recently at Churchill College, Cambridge.

Acorn Computers took an active part in the conference providing R140 Unix Workstations to give the 150 delegates hands-on experience of Lisp. The language is ideal for developing complete applications in areas such as CAD, simulation, knowledge-based systems and graphics.

Running at the conference was Delphi Common Lisp which is now available for the R140

Price of a Pawn

IN last month's review of The Pawn and Guild of Thieves, prices were wrongly given as £16.99 each. They are, in fact, £29.99 each and are available from Inter-Mediates (0279 600204).

Name's the same, but..

ACORN is taking a philosophical view of Commodore's decision to call its new Amiga the A3000 – nine months after that name was chosen – for the latest BBC Micro.

"There's nothing we can do about the situation", said corporate affairs manager Michael Page. "It is not possible to have trade marks of this kind. Anyone can call a machine anything they like. All we can say is that we were the first.

"I wrote to Commodore twice last year pointing out that I had heard rumours they were going to launch a machine called the A3000 and that it could confuse people. I got no replies".

Really moving headlines

TWEEN is the latest addition to the range of Archimedes film animation software from Ace Computing (0223 462212).

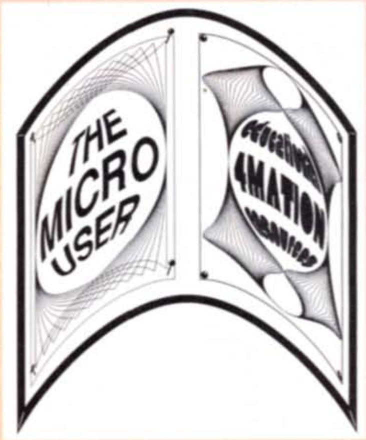
Using the techniques and terminology of the cartoon studio, it produces films from Draw files by calculating intermediate frames from a set of key positions. Two Draw files and the completion of a spreadsheet are all it takes to produce a simple animated film sequence.

Tween works with any Draw file including output from Graphbox, Presenter, various CAD packages and Ace's own 3D drawing package, Euclid.

Visual effects can also be achieved with text. For example using Tween, text output from FontFX, can be made to flow around a circle.

Tween also includes menu options which allow the size and shape of a film to be changed.

The package costs £30 and is available by mail order from Ace.



Stretch the good word

THE most ambitious project to date from 4Mation Educational Resources (0271 45566) is Poster, an Archimedes package which lets users to treat text like putty – squeezing, stretching and distorting it into almost any shape imaginable.

Mainly aimed at DTP enthusiasts who want to create imaginative posters, it can also be used for exciting titles, captions and even complete pages which can be imported into any DTP document which accepts Draw files.

"We believe that Poster will cause a great deal of excitement among Archimedes users", said Mike Matson of 4Mation.

"Poster has many unusual facilities but perhaps the most innovative feature is the ability to place text or indeed any type of Draw file into a mould consisting of either two or four paths. A second important feature is the border facility.

"Most DTP packages operate on the principle of placing text or graphics in a frame. Poster, on the other hand, allows borders to surround any object or group of objects".

Documents created with Poster can be of virtually any size. If they are larger than the largest sheet of paper which can be handled by a printer, the document is printed in sections with trim markers showing where to cut.

Poster will work with any printer for which a Risc OS driver is available. For users with Outline Fonts, the basic package costs £73.60. A complete package at £102.35 includes 20 outline fonts, an extra set of interesting borders and a disc of Draw files.

Never lost for a word

CROSSWORD enthusiasts will welcome XWord, the latest offering from Panda Discs, which is designed to help users construct these puzzles.

If you cannot think of a word that will fit, the program will search its dictionary and offer you a choice.

Once the grid is complete, the words are numbered by the program and you type in the clues.

The BBC version costs £14.95 and an Archimedes version is in the pipeline. Panda Discs are at Tinkers Lane, Brewood, Stafford, ST19 9DE.

Mouse on right track

LATEST from Watford Electronics (0923 50335) is a combination of mouse and tracker ball. Quest Tracer Ball has been ergonomically designed for efficient use with one hand.

While pointer position is controlled by the palm of the hand or by just one finger, its three buttons are neatly positioned for convenience and minimum effort.

Two versions are available. The BBC Micro option is fully AMX and Quest compatible. It works with AMX Stop Press, Superart, Quest Paint, ConQuest, Wapping Editor and others. Price, £32.

The Archimedes version costs £35.

The cottage that grew and grew

ONE of the success stories of the Acorn market has turned a cottage industry into a nationwide mail order business. Started in the front two rooms of a house in Portchester, WeServe (0705 325354) has now graduated to a prime location in the centre of the town.

The founder of WeServe, Peter Coates, started selling Acorn products in 1982 when customers came from as far away as Scotland to queue on his Hampshire doorstep to buy the new BBC B. "Visiting the shop was at times rather like going into Santa's grotto on the Saturday before Christmas", said Peter, who formed WeServe in 1985. "Children, adults and push chairs crammed into the hallway waiting their turn to get into the shop.

"When they got there, every square inch was given over to computer products and items long thought extinct have been known to appear on the shelves".

The business now has a nationwide customer base as a result of successful mail order selling and has outgrown its premises. Peter has acquired 4,500 sq ft of shop space in Porchester's main shopping precinct.

"In some ways, I'll be sorry to move but all our regular customers who have stuck by us should see a lot of improvements", he added. "We can give them the space and service they deserve". WeServe is now operating from 40-42 West Street, Portchester.

Become a Computer Genius!

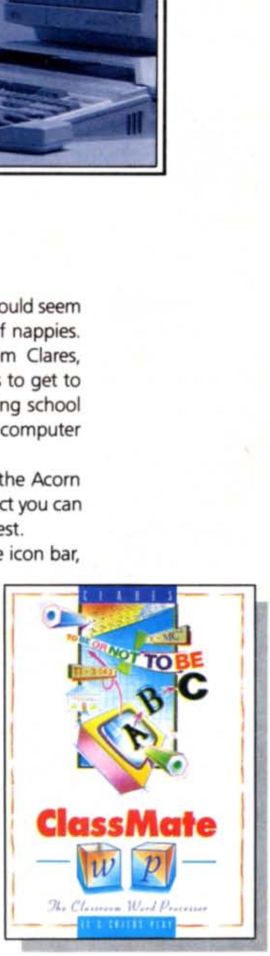
(with ClassMate it's possible at any age)

They're getting younger every year those computer wizards. It would seem that they're playing with the keyboards before they are out of nappies.

Now there's ClassMate. It's a new word processor from Clares, designed especially for the educational market. Allowing kids to get to grips with WP's from an early, tender age (until possibly leaving school or simply when they feel confident with word processors), no computer teething problems here.

It's a true RISC OS product that runs in windows. It uses the Acorn outline font manager and has a specifically designed font. In fact you can use any outline font such as those with Acorn DTP or Tempest.

Each young genius may have his or her own name on the icon bar, it also appears on the title bar of the text window. So their own masterpieces can be filed and called up whenever they want. The teacher has total control, however, being able to specify certain menu options inactive (the only thing worse than a wandering mind is a wandering mouse).



ClassMate WP from Clares is a boon to any child's education. Fun, simple to use, in fact (dare we say it), it's literally childsplay.

ClassMate W.P. — £39.95 (inc VAT)

CLARES
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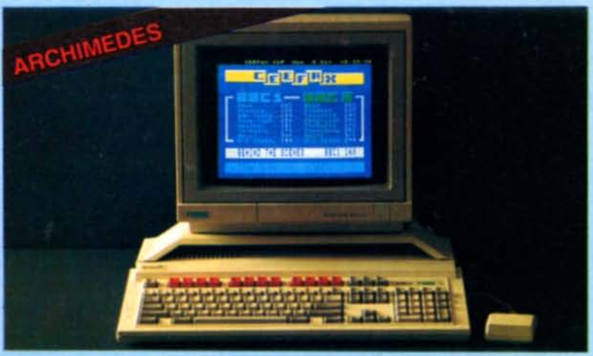

THE WORLDS MOST POWERFUL MICRO

A3000	£599	410/1	£1099
Learning Curve	£699	420/1	£1699
		440/1	£2099

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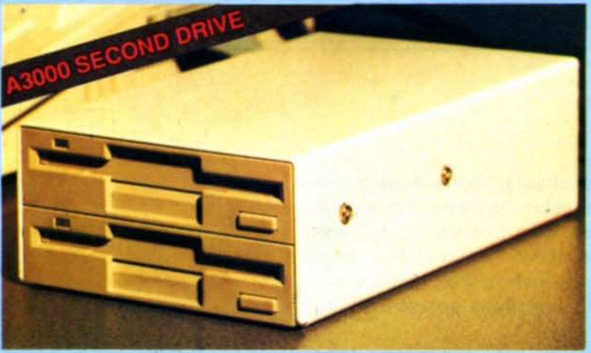
Buy any Archimedes and get an extra IMB RAM fitted for only £50 or a free A3000 Analogue & User Port Podule



THE A3000 OPTION ACORN FORGOT

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- ☐ High quality Japanese Drive
- ☐ Includes full fitting kit and instructions

Dual Drive Kit £125

LEADS & MISC. HARDWARE ETC.

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Arch Serial Lead	£8	Monitor Stand/plinth	
Arch Printer Lead	£6	BBC	£13
BBC Printer Lead	£6	Master	£14
2 to 1 Printer switch	£20	BBC/Master SCSI Hard Disc Interface	£50
3 to 1 Printer switch	£30	Eprom Eraser	£18
4 to 1 Printer switch	£36	Eraser with timer	£23
64k Printer Buffer	£115		
256k Printer buffer	£199		

(NOTE switching units & print buffers come with printer lead)

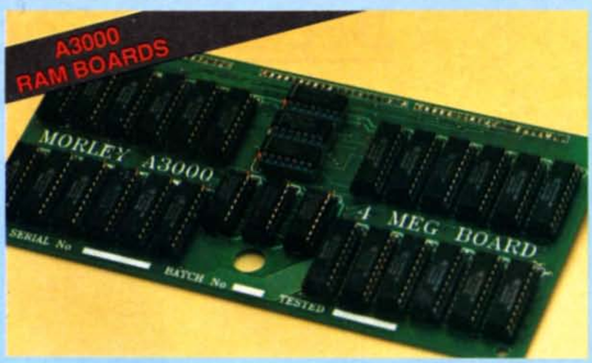
The Morley TELETEXT ADAPTER is now available for the Archimedes. The specification including screen dumps etc., is the same as the BBC version but connection is via a Podule socket. £125

EXISTING USERS OF OUR BBC TELETEXT ADAPTER WE CAN UPGRADE THE UNIT FOR THE ARCHIMEDES FOR £35

RING FOR DETAILS

We are now an Acorn dealer and service centre. If you would like to have a look at the A3000 or any other Acorn/Morley products please feel free to call in and discuss your requirements with our staff.

COMING SOON
ST506 Hard Disk Interface Podule
Ring for details



THE BEST VALUE MEMORY UPGRADES

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- ☐ A must for all serious Archimedes owners
- ☐ Make full use of Acorn's powerful Desk-Top Publishing package
- ☐ 1 Meg upgrade gives you a total of 2 Meg on-board
- ☐ 1 Meg board upgradeable to 3 Meg

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A3000	
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MORLEY

Kit includes: 5.25" Teac 80 track drive; case; power supply; interface and leads **£169**

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Including SCSI Podule, cased drive, cable and leads

20 meg	**£465**	30 meg	**£495**
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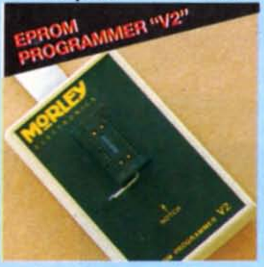

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WARNING
MORLEY

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  - Screen dump (any mode) to printer or disc.
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  - Extensive range of useful FX calls. **£30**

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MORLEY DISC DRIVES
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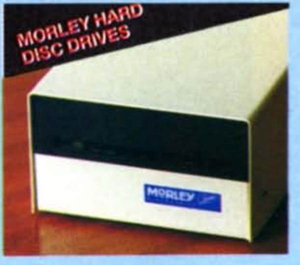
single £89 **dual £169** **power supply add £20**

MASTER CARTRIDGES



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Concept

• COLLECTION •

The Archimedes forms the ideal word processing and Desk Top Publishing machine. Indeed it is one of the few machines that has the computing power to successfully combine all aspects of document production in one simple-to-use system. Computer Concepts has three products that cover the three stages of document production: graphics input (Scan-Light), document editing and creation (Impression) and high quality printing (LaserDirect).

The Word Wise
Qume
A4
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Perfect Peripherals

IMPRESSION

The most powerful DTP package for the Archimedes. This program has gained wide acceptance from those who simply require enhanced word processing and from those producing high quality typeset publications.

Impression is the only DTP system optimised for use on 1MByte machines, such as the base model A3000. It is fast and compact - using the minimum RAM possible on a 1MByte machine leaving 300K of free workspace. This is enough for a 50,000 word document or a large amount of graphics. It requires the minimum number of disc changes when in operation on a single floppy machine. Indeed, once the program has been loaded, it is possible to operate it normally using the whole range of fonts with no disc changes.

This frame based DTP system (all text and graphics are contained within rectangular frames which may be placed at any position on the page) is simple to learn and use - only 5 main menu items control the whole program.

Other features include; 13 outline fonts (licenced from Acorn) for super high quality text on screen and printer - at any size. • Imports text from several word processors, Wordwise, Inter-Word, First Word Plus etc. • Imports graphics directly from Scan-Light, Draw, Paint and all other co-operating RISC OS programs • Handles very long documents - even larger than memory if necessary • Includes a spelling checker offering check-as-you-type, dictionary browse, crossword solving etc. • Includes printer drivers (licenced from Acorn) for a vast range of printers - all Epson compatible dot-matrix, LaserJet compatible inkjets and lasers, and PostScript for producing typeset material • Allows up to 15 documents in memory at once. • Windows may be scaled from 10% to 900% to show reduced page views or hugely expanded detail.

An eight page full technical specification of this product is available from Computer Concepts.

£149.00+VAT (£171.35 incl.)

SCAN-LIGHT 3000

Scan-Light 3000 is the only scanner designed specifically for the Archimedes A3000. The package consists of an internally fitting expansion board, power supply, software on board and a 400 dpi hand-held scanner.

Since the fully RISC OS compatible software is supplied in ROM on the expansion board, it can be started without the need to load anything from disc - it is always instantly available. The software is simple to use and has many advanced features; • Choice of monochrome or grey-scale scans • Scan resolutions of 100, 200, 300 or 400 dpi. • Unique grey-map control allowing total control over the brightness and contrast after the picture has been scanned (there is also a brightness control on the scanner). This even allows pictures to be inverted (you can scan photographic negatives) • Image manipulation facilities for picture smoothing and enhancement • Integration with other RISC OS applications allowing pictures to be transferred directly to other programs, such as Paint, Draw, Impression etc.

The Archimedes is a computer that can handle both graphics and text with equal ease, and Scan-Light is the best way to obtain pictures for the computer - ideal for capturing photographs, artwork or graphics of any sort.

£189.00 + VAT (£217.35 incl.)

Computer Concepts Ltd

Gaddesden Place, Hemel Hempstead, Herts.
HP2 6EX. Tel (0442) 63933 Fax (0442) 231632

LASER DIRECT

By using the power of the Archimedes RISC processor to produce the printed image, the LaserDirect offers a printer that is more flexible, cheaper and faster than alternatives. By using the RISC OS outline font capability it offers all the flexibility usually associated with PostScript printers, i.e. any font at any size. It also ensures that fonts used on screen will print exactly as required, at a full 300 dots-per-inch.

The LaserDirect system consists of a standard Archimedes expansion board (external case required for the A3000) which drives a special version of the popular Qume laser printer. By using the Archimedes RISC processor to do the processing, and the interface board to drive the printer directly, it avoids the normal controller board fitted in traditional laser printers. This means faster printing at lower cost. Print speeds are on average four times faster than traditional LaserJet compatible printers, yet the LaserDirect costs only £999.00 + VAT & carriage. It also has a very low running costs at around 2.3p per sheet (including paper).

The LaserDirect requires an Archimedes with at least 2Mbyte RAM. The package includes; printer and all leads, expansion board and software (on ROM so it doesn't have to be loaded from disc), 50 sheet paper tray and single sheet/envelope feed tray, drum and toner.

The LaserDirect is compatible with all programs that use traditional RISC OS printer drivers e.g Impression, Pipedream, Draw, Paint, Genesis etc.

£999+VAT & carriage (£1160 incl.)

All products listed here are available on a one month 'no quibble' money back guarantee when purchased directly from Computer Concepts.

More information on any of the products listed here or any of our Archimedes range, and print samples, are available from Computer Concepts.

Details subject to change.
All trademarks are acknowledged. Products also available from all good Acorn dealers.

COLOURJET 132

HIGH PERFORMANCE COLOUR INK JET PRINTER

(compatible with IBM pc, BBC micro, Nimbus etc.)

- ★ PRINTS ALL 64 SCREEN COLOURS FROM CGA AND EGA USING OPTIONAL INTEGREX SOFTWARE
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TEXTILE PRINTING
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UPDATE

The prof graduates

THE 8 bit educational package, Learn to Read With Prof, from Prisma Software's Play and Read series has graduated to the Archimedes and BBC A3000. The package contains the usual five reading books, the story cassette and the new up-graded software.

"We have high hopes for the A3000 version, especially with Acorn's Learning Curve bundle," said Jason Salisbury from Prisma (0244 326244).

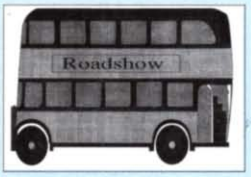
Price of the 32 bit version is £29.99.

Several new products in the Play and Read series are planned for release soon, including Prof Looks at Words, Prof Makes Sentences and Prof Hunts for Words. All will be available in 8 and 32 bit formats.

Acorn roadshow ready to roll again

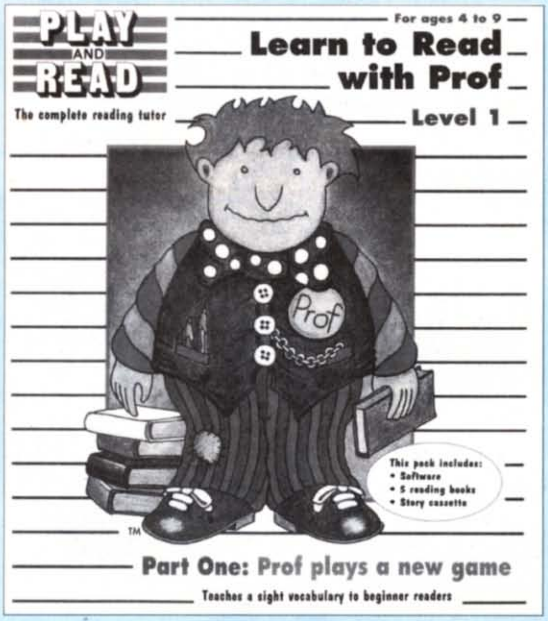
THE first Acorn roadshow in May is being followed by another in November. Acorn Education and about 20 software houses will be represented at the events where a wide range of innovative software for primary and secondary use will be on display.

Software producers represented at the events include 4Mation, Clares, Computer Concepts, Minerva, Longman Logotron and Silicon Vision.



With others they will be showing solutions covering areas like special needs, control, art and design, imaging, mathematics and productivity tools for both standalone and networked use.

The show is on the road from Monday November 26 to Friday 30 November and will call at the Eastern Counties, South East Region, Merseyside/North Wales, Yorkshire and South Scotland.



More power for adventures

ENHANCED versions of the popular junior adventures The Worst Witch and Stig of the Dump have been launched by Sherston Software (0666 840433).

Both have been re-written by author Marshal Anderson to take advantage of the 32 bit machine.

The adventures, based on the popular children's books by Jill Murphy and Clive King, are designed to encourage thought and careful reading as children have to read the books very carefully if they want to succeed in the adventures.

"We have found it easier to embellish the illustrations with additional detail that can change as the story goes along, while the greater speed and capacity of the new machine means the adventures are able to process text faster", Marshal Anderson told *The Micro User.* "Especially in The Worst Witch there is much additional text which creates a more real adventuring environment".

Also now available from Sherston are several other 8 bit BBC Micro programs transferred to run on the Archimedes series. Most recent releases are Teacher's Cupboard, Animated Alphabet, Dream Time, The Farm and Teddy Bears' Picnic.

Micro transfers come thick and fast

in FRENCH
LET'S SPELL
AT HOME
LET'S SPELL
AT THE SHOPS

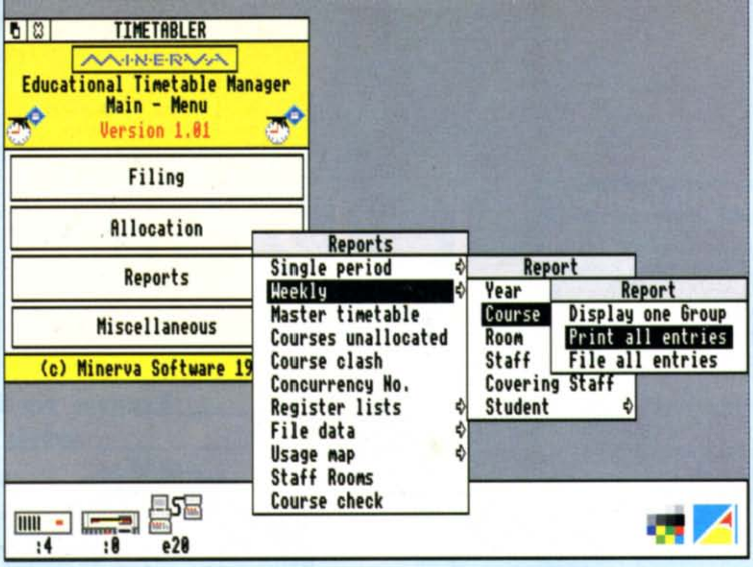
MORE conversions of 16 bit educational programs are almost ready for release by Soft Stuff (0732 351234). Following on from Spell Book 4 to 6, Spell Book 7+, Things to Do With Words and Things to Do with Numbers are the next titles.

Claimed to be a new and exciting concept in learning to spell, Lets Spell at the Shops will be available in English or French versions. The aim of the program is to teach children letter recognition and spelling with the aid of graphics and digitised sounds..

At the same price, the second in the Lets Spell series – also soon to be completed – is Lets Spell at Home, English and French versions. This is set in the home and garden and, as with all Lets Spell software, Soft Stuff says it features four levels of difficulty, mouse control and that it conforms to the National Curriculum.

"All that needs to be completed is for the digitised sounds of the letters to be put into the programs", Dave Chamberlin, director of Soft Stuff told *The Micro User,* "then we'll move on to complete Puzzle Book Volumes 1 to 4 which are also well on the way to being converted".

All Soft Stuff's products on the Archimedes series cost £24.95.


TIMETABLER
MINERVA
Educational Timetable Manager
Main - Menu
Version 1.01
Filing
Allocation
Reports
Miscellaneous
(c) Minerva Software 19
Reports
Single period
Weekly
Master timetable
Courses unallocated
Course clash
Concurrency No.
Register lists
File data
Usage map
Staff Rooms
Course check
Report
Year
Course
Room
Staff
Covering Staff
Student
Report
Display one Group
Print all entries
File all entries
:4
:0
e20

Timetable main menu structure

Turn the tables on time

Rog Frost explores a program that takes the sting out of the syllabus for deputy heads

IN the last few weeks deputy heads throughout the length and breadth of Britain have been having their annual nightmare: Compiling the school timetable for the next academic year. But the advent of Timetabler for the BBC A3000 and Archimedes range could spell the end of the horrors that accompany this yearly trial.

To begin on a technical level, Timetabler is a relational database which operates in the Risc OS DeskTop environment. And that ends the technical aside, since the whole process is designed for people who produce school timetables and Minerva has decided that such people may not be interested in the internal workings of the system.

Instead, you get a very friendly piece of software which makes maximum use of the mouse for inputs and cuts data entry to an absolute minimum. There is really no need for any computer expertise at all.

The first task is to create the master or KEY file. This is a list of the filenames of the other sets of data and also contains other information such as whether printouts should have days across the top of the page or down the side. The next step – as you might expect in this type of program – is to enter all the relevant information into the five main data files.

Product: Timetabler
Price: £599 plus VAT
Supplier: Minerva Software, 69 Sidwell Street, Exeter, Devon EX4 6PH
Tel: 0392 437756
Requirements: Archimedes series or BBC A3000

Details of the lessons, break times and how many days there are in a teaching week are contained in the Periods file. Up to 15 periods a day can be created, spread over a 15 day teaching week. Any particular period can be closed to allow for days of different lengths or for specific events like whole school assemblies.

The next task is to create the Room file. Each room is given a full name and an abbreviation. Its capacity – in pupils – is entered along with its suitabilility for more than one class. The program can cope with up to 255 different rooms.

With all data needed to be entered it is as well to be organised before starting, since the way you type the information is the order in which you will have to use it – such as when allocating rooms to courses.

The Year file comes next. This starts in a similar way. Each year within the school has a name and abbreviation – then the separate groups within it are entered. It is essential to enter enough groups to allow for all eventualities. For example, it could be that more teaching groups are needed for Design and Technology than for other subject areas.

One of the most important files is for Courses. This has to contain details of each and every teaching subject which can be allocated to one or more group. For each group you have to enter the title, abbreviation and overall subject area. Then come the actual groups that take it and a list of suitable rooms. Also required are the number of periods in a week and the block size – single or double lessons and so on.

Courses can be linked to others so that they can be forced to occur at the same time and can be given high or low priority. They can be barred from being on the same day as another course or can be allocated to a particular part of a day. A total of 383 can be created.

The method of inputting data is very

speedy. Once one has been entered it can be repeatedly copied for all similar ones. This means that for most only a small alteration is required.

The final essential file is for Staff. As might be expected this contains the name of each teacher and a suitable abbreviation – to a total of 255. Subject areas can be allocated to staff as can a room and a number of free periods. Part time staff, or staff with duties away from the classroom, can have non-teaching periods allotted to them. These are effectively closed.

Having entered the basic details, the major task of allocating courses to staff can begin. This is most efficiently done while creating the staff file and it provides the heart of the information.

As an optional addition you can also create a Pupil file containing name, sex, year, group and courses taken by each pupil. The program can then print out individual timetables.

In my trials I have not used this facility but it could certainly have benefits where pupils are involved in options. Even then, it may not be essential to enter details of each pupil – a dozen sample students with names like *Option A* could be used. For those with time and patience, details of up to 32000 students can be handled.

Having entered all the data, it is essential to save it – an asterisk is shown on the main menu when there is unsaved data. Saving is slightly cumbersome since each of the created files must be saved separately.

At this stage first trials can be made to allocate the timetable. For my small comprehensive school of 550 pupils it takes seconds rather than minutes. During allocation a window opens which shows you what the micro is working on, but most of the time this flashes too fast to be read.

With luck – or adequate preparation – a message will appear which says: *All periods allocated.* In this case you can save the actual timetable and start with the reports and printouts. More probably at the first attempt, the message will tell you that a certain number of periods are not allocated. A reason can be given for such problems which might be *Staff not available* or *No pupils.*

If the number of unallocated periods is large you will probably need to edit staff data or course data so that different teachers teach different groups. It is possible to check on the *staff usage map* to find which have not had lessons allocated for various periods – this can help with editing decisions.

If the number of problem lessons was small it might be that you could make compromise decisions – not the usual teacher for a group – and finish the allocation manually.

If the task you've set the program is possible, with enough staff to cover all of the courses, then a finished timetable will be produced.

It is possible that you may not like the distribution of lessons – perhaps it might cause too much movement between buildings on a split-site school. If this is the case then it is best to scrap that version of the timetable and start with a little manual work allocating certain courses yourself. These then force the program into a certain pattern after which you let it take over. Remember, it takes only seconds to do the job.

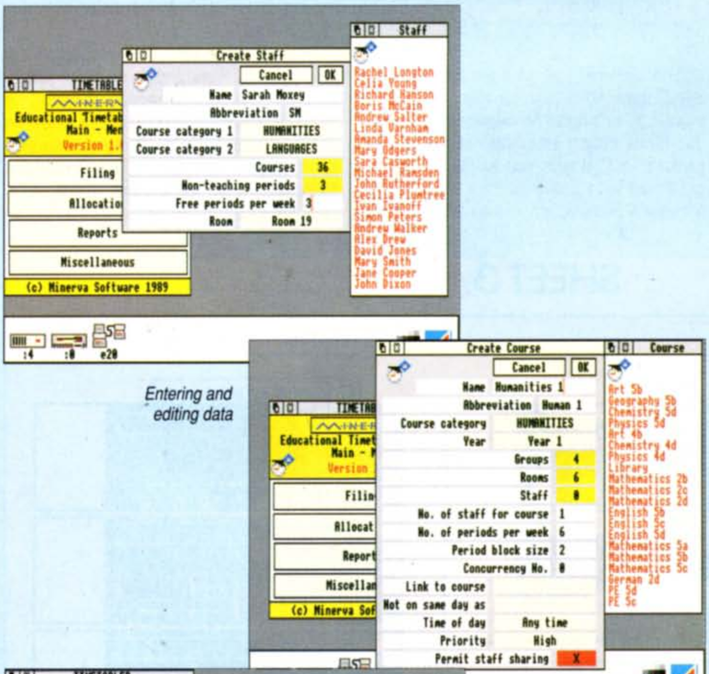
Once completed, we come to the printouts. Each member of staff and each pupil group can receive a clear, A4 size copy of their timetable. A usage printout can be obtained for each room – so you can find out which ones are not used at certain times and you can print a master timetable report.

This is period-based and contains the name of each staff member, their course and room for that period. Register lists can be printed for each course if pupil data has been included.

One more feature of this program is its ability to figure out cover for absent staff. Enter the name of the absentee and the timetable period and the best two names are presented for cover.

On the face of it, Timetabler is very expensive. And all you get is a single disc and a small – albeit excellent – manual. What is hidden is that you also get a hot line to Minerva's experts as comprehensive support is offered to registered users. The problems I encountered were sorted out very speedily with just one phone call.

Not only that, there's no headache and, once the data is in, the job is over quickly. The number of hours that will be saved in the first year alone could easily cover the cost in time otherwise lost.



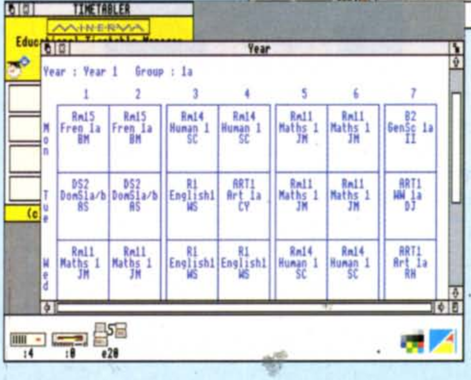
Name Sarah Moxey
Abbreviation SM
Course category 1 HUMANITIES
Course category 2 LANGUAGES
Courses 36
Non-teaching periods 3
Free periods per week 3
Room Room 19

Rachel Longton
Celia Young
Richard Hanson
Boris McCain
Andrew Salter
Linda Varnham
Amanda Stevenson
Mary Odgers
Sara Casworth
Michael Ramsden
John Rutherford
Cecilia Plumtree
Ivan Ivanoff
Simon Peters
Andrew Walker
Alex Drew
David Jones
Mary Smith
Jane Cooper
John Dixon

Name Humanities 1
Abbreviation Human 1
Course category HUMANITIES
Year Year 1
Groups 4
Rooms 6
Staff 0
No. of staff for course 1
No. of periods per week 6
Period block size 2
Concurrency No. 0
Link to course
Not on same day as
Time of day Any time
Priority High
Permit staff sharing X

Art 5b
Geography 5b
Chemistry 5d
Physics 5d
Art 4b
Chemistry 4d
Physics 4d
Library
Mathematics 2b
Mathematics 2c
Mathematics 2d
English 5b
English 5c
English 5d
Mathematics 5a
Mathematics 5b
Mathematics 5c
German 2d
PE 5d
PE 5c

Entering and editing data



Year : Year 1 Group : 1a

	1	2	3	4	5	6	7
Mon	Rm15 Fren 1a BM	Rm15 Fren 1a BM	Rm14 Human 1 SC	Rm14 Human 1 SC	Rm11 Maths 1 JM	Rm11 Maths 1 JM	B2 GenSc 1a II
Tue	DS2 DomS1a/b AS	DS2 DomS1a/b AS	R1 English1 WS	ART1 Art 1a CY	Rm11 Maths 1 JM	Rm11 Maths 1 JM	ART1 WW 1a DJ
Wed	Rm11 Maths 1 JM	Rm11 Maths 1 JM	R1 English1 WS	R1 English1 WS	Rm14 Human 1 SC	Rm14 Human 1 SC	ART1 Art 1a RH

Viewing a time table

Summing up

This program takes the agony out of one of the more onerous jobs of a deputy head and leaves them more time for their many other tasks. It's an absolute bargain, even at this price.

Power to

Rog Frost cuts through the static and juggles with therms and kilowatt hours

THE supply of electricity to our homes is something we all take for granted. Children have grown up in an age when, subject to gales, we can flick a switch for instant electric action.

Some may have some idea about the process that happens at a power station, but most will have no idea about the difficulty of producing the required quantity of electricity against a continuously altering demand and no method for storing the commodity. It is this last problem that the Primary Power Package is designed to deal with.

I can already hear the scientific reader grumbling about the name. After all, electricity is not a primary power source, since it requires another source of energy to make it. However, the Primary in the title refers to the expected age of the pupils who will make use of it. In fact, the material makes it quite clear that the target age range is top primary. The software could also find a home within secondary maths, science, geography or technology lessons.

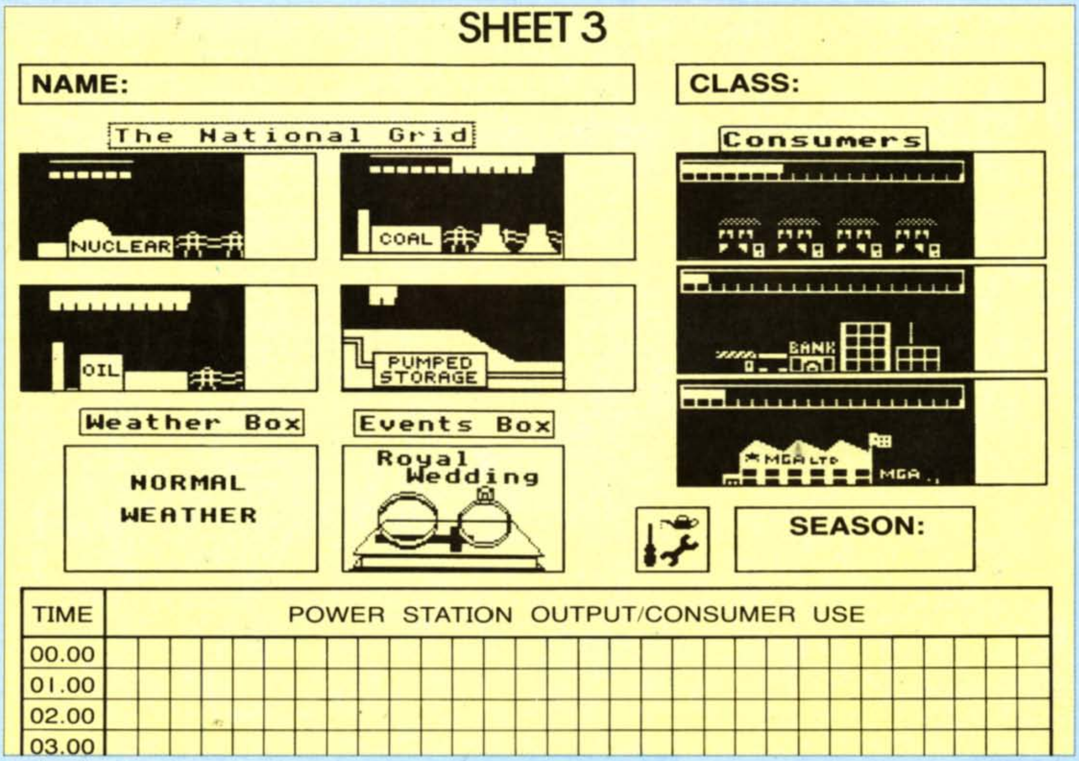
Product: Primary Power Package – Understanding Electricity
Price: £10
Supplier: Educational Service, The Electricity Association, 30 Millbank London SW1P 4RD.
Tel: 071-834 2333
Requirements: BBC B, B+, Master, Archimedes series or BBC A3000

The software comes on a standard 40/80 track DFS disc for the older 8 bit machines or on an Archimedes disc, but this forms only a small part of the whole pack. Your £10 gets you an A4 sized file crammed with goodies. First comes the teacher's book which explains the workings of the program. It also covers the methods employed by the electricity generating companies to ensure we get the cheapest possible supply and no power cuts. Topic webs for teachers and suggested classroom usage are included too.

The glossary of terms will allow you to overcome problems like *"What is a base load station?"* or *"What do pumped storage stations do?"*.

The curriculum materials include sturdy and colourful workcards along with photocopiable masters of record sheets. The workcards will get youngsters working on the software in a productive manner, searching for information, recording it and then carrying out some simple analysis.

A small bonus is the wall chart con-



SHEET 3

NAME:

CLASS:

The National Grid

Consumers

Weather Box

NORMAL WEATHER

Events Box

Royal Wedding

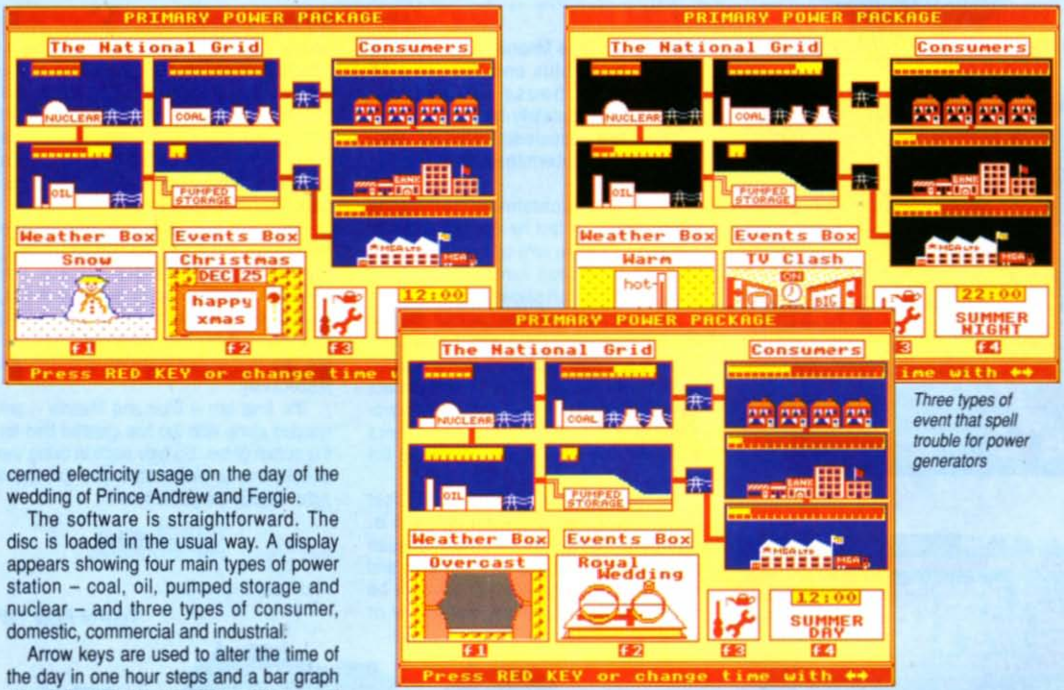
SEASON:

TIME	POWER STATION OUTPUT/CONSUMER USE
00.00	
01.00	
02.00	
03.00	

NUCLEAR
COAL
OIL
PUMPED STORAGE
BANK
MGA LTD
MGA

Pupil's work card

your budget


PRIMARY POWER PACKAGE
The National Grid
Consumers
NUCLEAR
COAL
OIL
PUMPED STORAGE
Weather Box
Events Box
Snow
Christmas
DEC 25
happy xmas
12:00
f1
f2
f3
Press RED KEY or change time
Warm
hot
TV Clash
ON
BIC
22:00
SUMMER NIGHT
f4
ime with ↔
Overcast
Royal Wedding
SUMMER DAY
Press RED KEY or change time with ↔

Three types of event that spell trouble for power generators

cerned electricity usage on the day of the wedding of Prince Andrew and Fergie.

The software is straightforward. The disc is loaded in the usual way. A display appears showing four main types of power station – coal, oil, pumped storage and nuclear – and three types of consumer, domestic, commercial and industrial.

Arrow keys are used to alter the time of the day in one hour steps and a bar graph shows how much electricity each type of power station produces and how it is used by the consumers.

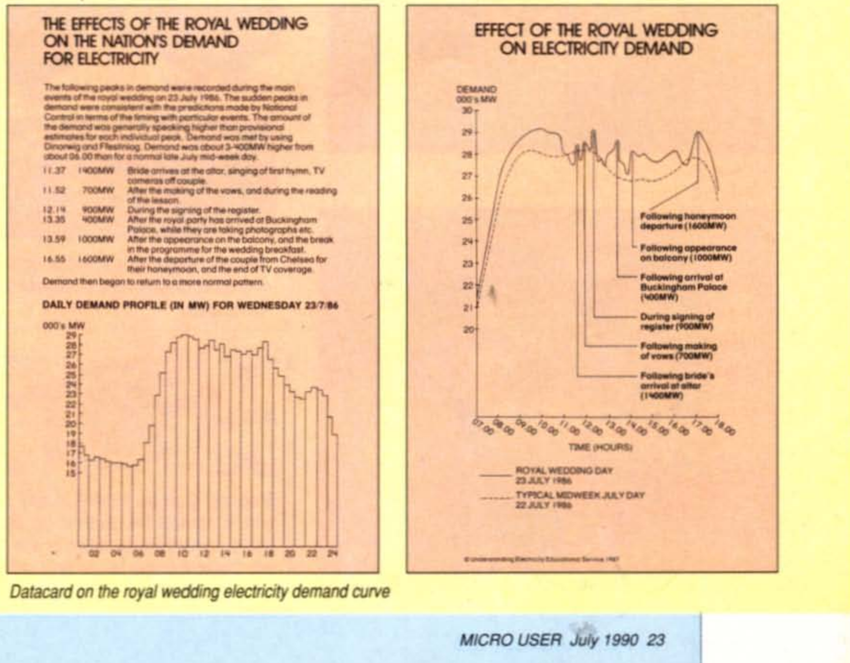
This information is not stored by the computer – children using the program must transcribe the data on to the record sheets.

Function keys can be used to alter the season of the year and the type of weather. Power stations can be closed for maintenance and days can be selected with special events such as a rail strike or popular TV programs.

Primary Power Package is suitable for use by small groups of youngsters as a part of a project on energy or power. It also works well with a whole group, using the computer as an animated blackboard.

Summing up

I have reservations about the style of the language in some of the pupil materials. These are aimed at the brightest children in the age range and will need some simplification for many youngsters. Overall, this package is to be recommended at this bargain price.



THE EFFECTS OF THE ROYAL WEDDING ON THE NATION'S DEMAND FOR ELECTRICITY

The following peaks in demand were recorded during the main events of the royal wedding on 23 July 1986. The sudden peaks in demand were consistent with the predictions made by National Control in terms of the timing with particular events. The amount of the demand was generally speaking higher than provisional estimates for each individual peak. Demand was met by using Dinorwig and Ffestiniog. Demand was about 3-400MW higher from about 06.00 than for a normal late July mid-week day.

11.37	1400MW	Bride arrives at the altar, singing of first hymn, TV cameras off couple.
11.52	700MW	After the making of the vows, and during the reading of the lesson.
12.14	900MW	During the signing of the register.
13.35	400MW	After the royal party has arrived at Buckingham Palace, while they are taking photographs etc.
13.59	1000MW	After the appearance on the balcony, and the break in the programme for the wedding breakfast.
16.55	1600MW	After the departure of the couple from Chelsea for their honeymoon, and the end of TV coverage.

Demand then began to return to a more normal pattern.

DAILY DEMAND PROFILE (IN MW) FOR WEDNESDAY 23/7/86

000's MW
29
28
27
26
25
24
23
22
21
20
19
18
17
16
15
02
04
06
08
10
12
14
16
18
20
22
24

EFFECT OF THE ROYAL WEDDING ON ELECTRICITY DEMAND

DEMAND 000's MW
30
29
28
27
26
25
24
23
22
21
20
07.00
08.00
09.00
10.00
11.00
12.00
13.00
14.00
15.00
16.00
17.00
18.00
TIME (HOURS)
Following honeymoon departure (1600MW)
Following appearance on balcony (1000MW)
Following arrival at Buckingham Palace (400MW)
During signing of register (900MW)
Following making of vows (700MW)
Following bride's arrival at altar (1400MW)
ROYAL WEDDING DAY 23 JULY 1986
TYPICAL MIDWEEK JULY DAY 22 JULY 1986

Datacard on the royal wedding electricity demand curve

BLUE

Here's another great type-in game from the imaginative Mike Goldberg

THE Blue Meanie is as mean as he is blue and lives in a 30 room house full of junk. Unfortunately he keeps losing the occasional valuable item, so now he's determined to clean the place up.

Every room contains something he really wants – in fact he wants it so badly that he can't leave until he's reached it. Of course his precious items are always in those hard-to-reach places...

The controls for moving the Blue Meanie are the standard Z, X, * and ? plus D for when you know you can't complete the screen. The first six of the 30 screens are fairly easy but there are some very convoluted single-solution ones and others which depend on how you completed the previous screen.

At the start of each screen the lost object flashes so you know where it is. Then you have a limited time to push things around until you can pick it up and reach the exit arrow – which can only be accessed from the side, not below or above. Some of the screen is just background rubbish which is swept out of the way as you go over it. But there are numerous other items which behave in strange ways when you push them – the panel below shows what they do. When pushing sideways only the top half of the Blue Meanie is effective.

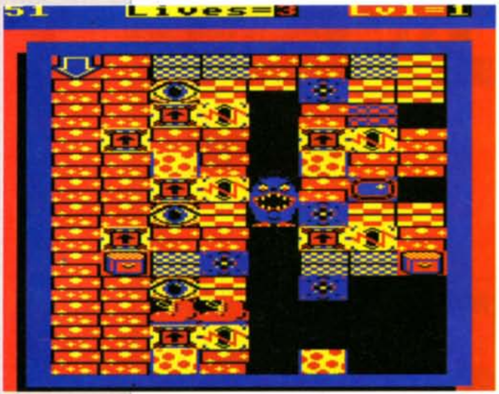
There are four listings to type in: The first creates the machine code for handling the sprites and the second creates the sprites used. You should type these in first, ensure you've made no mistakes using the checksums, save then run them. They create two files called ACode4 and 33ikons respectively.

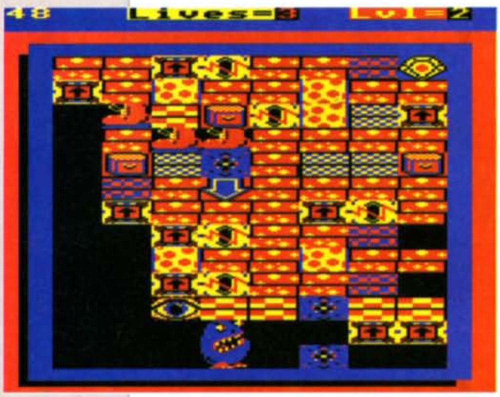
The final two – Blue and Meanie – are needed along with the two created files for the actual game. So type each in using the checksums to make sure you get them right. To play the game type in:

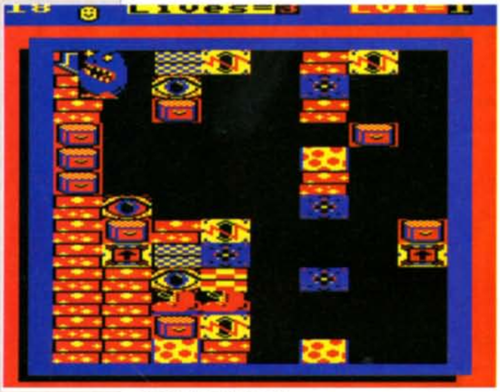
```
CHAIN"Blue"
```

And have a lot of fun.

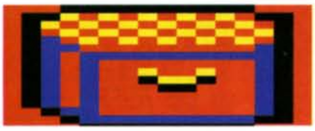
Turn to Page 120



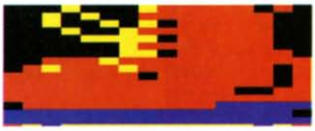




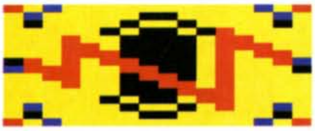
Clearing the first level



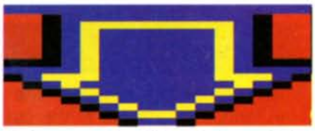
Chest: Can be moved left or right over any other background or item except a *Blue* block.



Boot: When pushed it moves downwards through any other object except through the immovable Blue block.

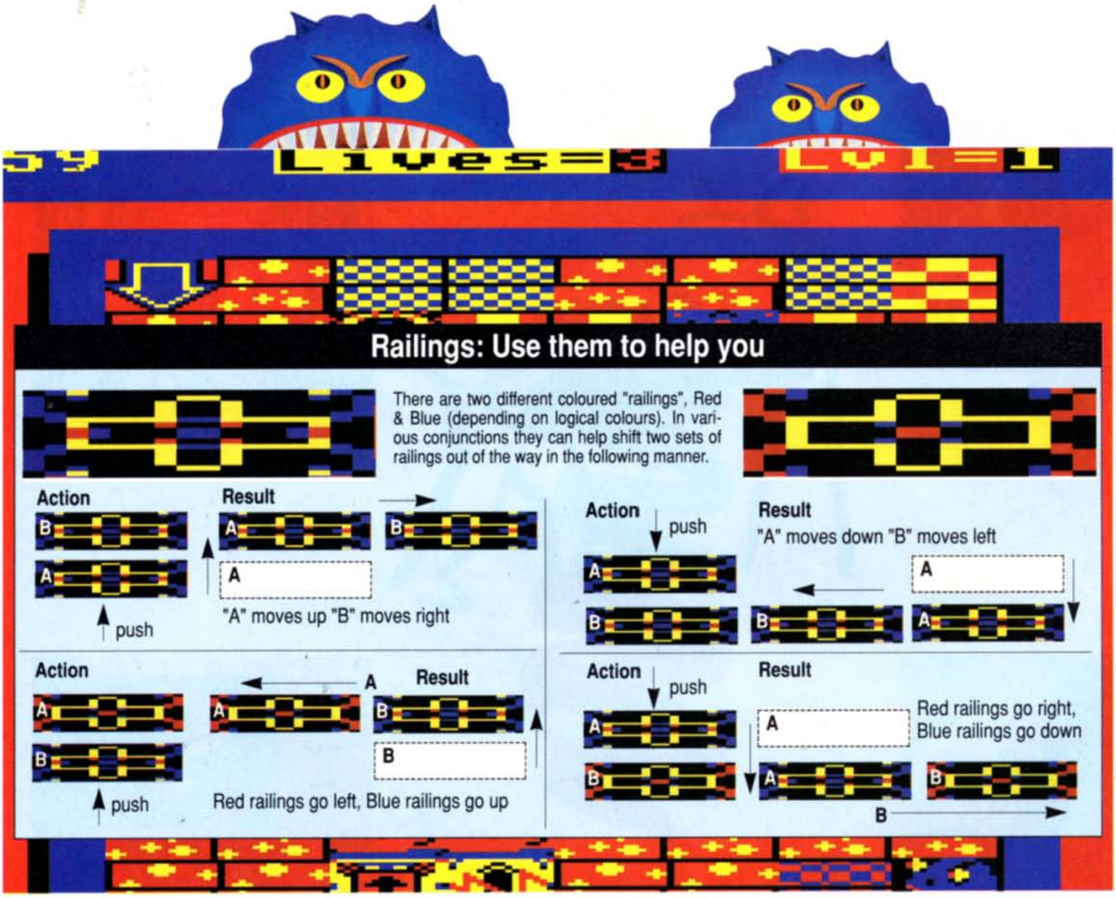


Magnet: Can be moved in any direction. It attracts the nearest Up block if being pushed up or down or the nearest Chest if going left or right unless a Blue is in the way.



Exit arrow: Acts like a Blue until the lost object is collected. Then anything pushed sideways into it gets swallowed, if the Blue Meanie walks into it he moves to the next screen.

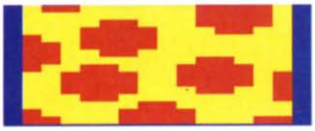
MEANIE


59
Lives=3
Lvl=1

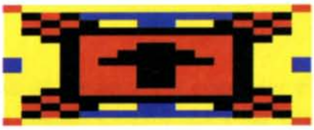
Railings: Use them to help you

There are two different coloured "railings", Red & Blue (depending on logical colours). In various conjunctions they can help shift two sets of railings out of the way in the following manner.

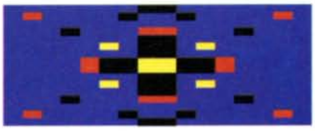
Action
Result
B
A
A
B
A
push
"A" moves up "B" moves right
Action
push
Result
"A" moves down "B" moves left
A
A
B
B
A
Action
A
Result
A
B
A
B
B
push
Red railings go left, Blue railings go up
Action
push
Result
A
Red railings go right, Blue railings go down
B
A
B
B



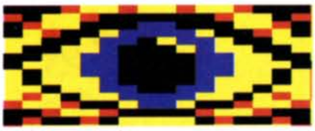
Spots: When pushed from below it bounces and turns into a *Chest*, *Up* or background block.



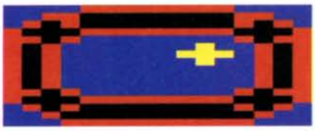
Up: When pushed it moves up through any other object except through the immovable Blue block.



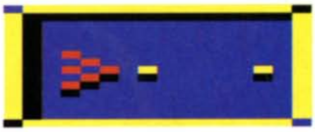
Blue: This immovable object will present the hardest problems when trying to manoeuver another block round it.



Eye: Moves left and right only by one position at a time, changes all Ups to Chests and all Chests to Ups. Then it changes colour and can no longer be moved.



Mystery boxes: You get mystery boxes on every fifth screen. They can go in any direction but their effect varies – it's up to you to find out exactly what they do.



Snooker tables: These can be pushed down or right but not left or up – unless pushing against another snooker table, in which case the first moves on to the second.

ATELIER

The definitive art package for the
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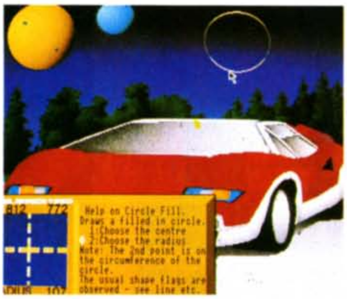

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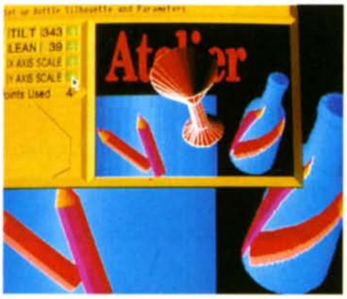
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Pretty Pix

FREE

Teri Paul looks at graphics software as she continues her survey of the 32 bit public domain world

NOW we're really starting to swing. As I promised last month, we've got some graphics programs to examine – and, as usual, there'll be a pile of goodies on this month's *The Micro User* subscription disc.

Sandie the Walrus of STWPD has provided two discs packed with graphics utilities and games – among them !Translator. Written by John Kortink of the Netherlands, this software was used to convert the 4096-colour Amiga picture of Samantha Fox in last month's *The Micro User.*

We've also been trying it out with files from other machines that it claims to accept. We tried two MacPaint pictures which we imported from the Apple Macintosh. One, created in the Illustrator package and saved in MacPaint format, didn't work. But a pure MacPaint image came over successfully.

Next we transferred some Atari ST screens, two in the PI1 16 colour mode and the other using the 2 colour PI3 mode. Both came out fine, as you can see in Figure I.

!Translator has numerous options for saving the full image or parts of it with or without the image or screen mode palette. The program itself selects the most appropriate mode for display.

Next is the famous ChangeFSI that's creeping its way into lots of commercial software as an ideal image conversion routine. The program is called via the command line with various parameters added. However it's available with a multi-tasking front-end so you can use it from the DeskTop.

ChangeFSI differs in the way it handles images in that it performs anti-aliasing. The end result is much higher quality – but at the cost of speed, as it is written in Basic.

The way the front end crashed utterly on a bad filename error and when it was presented with a format it didn't understand was disappointing – future versions will undoubtedly correct this.

The number of file formats that ChangeFSI can handle is astounding and way beyond what we were able to test – but that doesn't include ST ones.

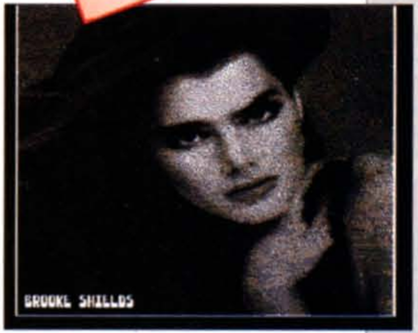
Ray tracing

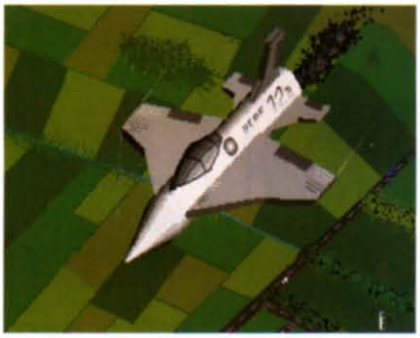
Another gem of a program is !QRT – Quick Ray Trace. I think the *Quick* refers to the speed you can build the text files used to produce the picture – not the speed of picture drawing itself.

!QRT was ported from another micro, but the C source code has been modified so that it runs as a proper multi-tasking program – in fact you can continue working while !QRT builds a picture.

The disadvantage is that the process takes a considerable time – I think a Quick button on the dialogue box to make it take over the whole machine would have been

➤





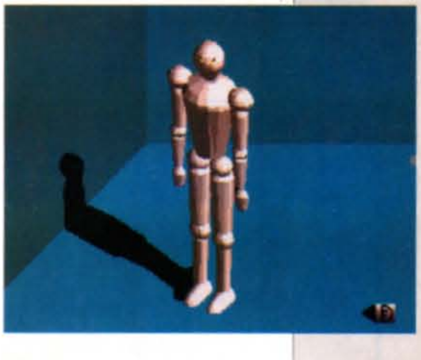


Figure I: Three Atari ST screens converted to the Archimedes

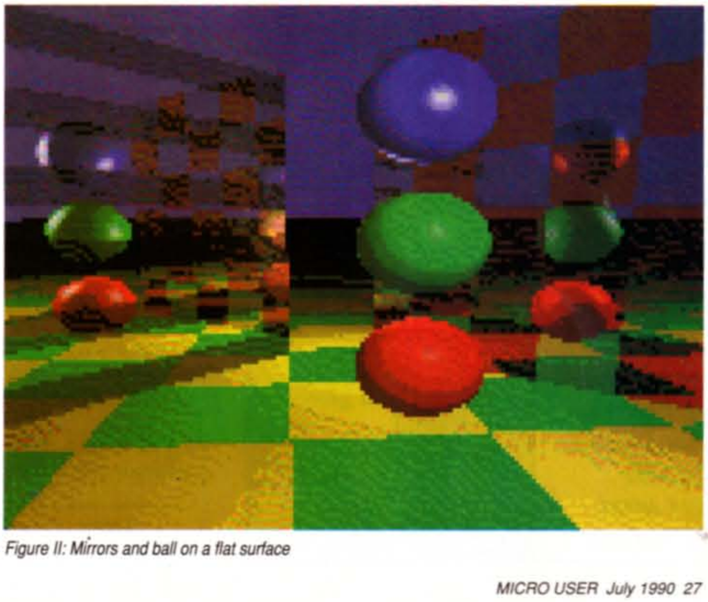


Figure II: Mirrors and ball on a flat surface

useful. Along with !QRT itself comes a standard set of files including all the documentation with a description of the language used, plus a number of sample files – Figures II and III show how results look.

The original !Run file doesn't load up the Shared C Library – although it does load the Floating Point emulator – but I've done a quick modification, so the version you get will be fine.

Painting

Also supplied by Sandie is !Arctist+ the non-multi-tasking art program that was originally not PD but now is. The !Run file for this was not well written – sorry Nigel – but I've popped the whole thing on the subscription disc modified to work properly.

You'll need *MemAlloc* in the !System.modules directory – you can transfer it from the !Lander directory on your Applications disc 2.

Blush

Last month I said you could write !STracker files with !STplayer. Well my enthusiasm got the better of me – you can't. To commiserate I have included three brand new !STracher modules for you to play.

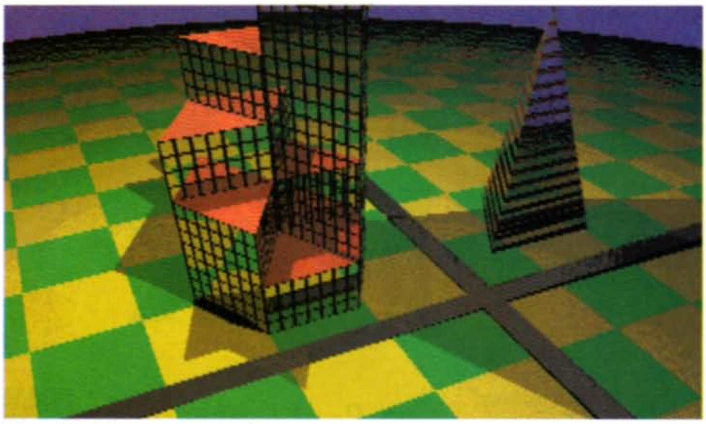


Figure III: Buildings on a curved surface

Viruses

Some of you were caught out by the !Wanda program I put on last month's subscription disc. It was set to auto-boot and the first many of you saw of that great little program was bubbles rising from behind a window. The !Wanda program isn't a virus because it doesn't copy itself on to other discs and, even if it did, you can see exactly where it is and what it's doing. By pressing *keypad* *+Reset you could catalogue a disc and delete !Wanda without it loading up. Viruses are sneaky – you wouldn't even know it was there until it did something bad.

A virus *could* be written for the Archimedes series and BBC A3000 and I know at least one way of doing it but I ain't telling.

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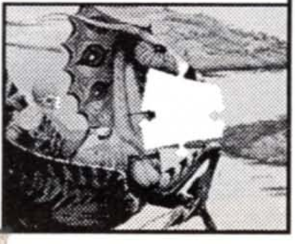

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High velocity hacking

Hac Man crams in a mega-amount of hints, tips and pokes for both the 8 and 32 bit Acorn machines.

WELCOME to another collection of games old, new, re-released and – well – green and scaly. Before we start, however, I ought to point out something that many MicroLink users will already know. I have been on the system for some time now, so if you have any tips, hints or pokes to pass on to fellow gamers, just drop a line to MAG058.

Of course, I always welcome feedback via what has been described rather unkindly but all too accurately as snailmail. However, I must once again emphasise the need for a stamped addressed envelope before I can undertake to provide an answer other than through these pages – no SAE, no reply. Sorry.

Power Pills

- Getting to Hac Man on MicroLink
- Overdrive pokes for cassette
- Palace of Magic password explained
- Life of Repton edit code error
- Pacmania not hard enough?
- Labyrinth and Arcadians Hits 2 cheats
- FireBall II personalised high scores
- Codename:Droid cheats – no changes
- Embarassing Elite error!

Not so Elitist...

Whoops! Apologies to any Master owner who may have typed in John Sparrow's ram bank relocation routine for the Master version of **Elite** that appeared in the March 1990 issue, because it didn't work. The reason is nothing to do with the author, but that yours truly couldn't read John's letter.

I missed out a line when I was entering John's routine into my own machine; consequently one of the sideways ram calls made by the program was not redirected to the correct ram bank. In addition, I omitted a colon from line 100 – not a good month for Hac Man.

To correct these errors, please make the following amendments to the original listing, then re-save it under the original filename:

```
100 MODE 7:PRINT "Please insert Elite
disc (Superior version, side 2) and
press any key...";:*FX15,0
124 !&900=&A9FFF720:?&904=bank
126 !&905=&6015718D:!&F25=&CBA20900
```

Doctor Hac Man's Surgery

STATUS
CODENAME : DROID
Stryker's Run-Part 2
POWER
ALERT
PROGRAMMING BY
MARTIN EDMONDSON & NICK CHAMBERLAIN
ACE

Making Pacmania harder

In response to February 1990's feature on cheats for **Pacmania** I have received a letter from Londoner Nicholas Brown who complains that Pacmania as it stands is too easy, even without the aforementioned cheats. Indeed, Nicholas munched his way to the finale screen in a mere three days.

Nicholas asks if it could be made more difficult, and specifically asks for more monsters – particularly purple ones – faster monsters, faster early screens and features in general to make the game as challenging and thrilling as its classic predecessor Snapper.

I would certainly go along with this request – indeed, regular readers may remember my Snapper upgrade in the August 1987 issue, in which I gave the option of not receiving an extra life at 15,000 points, in order to make the game more difficult. I am by no means averse to the idea of making games more difficult.

Unfortunately, I've not yet found the time to have even my first dabble with ARM code. So I'll have to pass this request out to a wider audience. However, I know that the default values of credits and lives on Pacmania are 3 and 5 respectively; I am sure that an extra edge could be added to the game by reducing these values. More than that I cannot say.

Can anyone help a frustrated Pacmaniac?

Arcadians rebirth

Readers of last month's column may recall two cheat routines for another title on the Acornsoft Hits Volume 2 – Orlando's ever-popular **Arcadians**. These routines provided extra or infinite lives for the 5.25in and 3.5in disc versions. I also promised an equivalent routine for the Hits 2 cassette version of Arcadians some time in the not too distant future. As with Labyrinth, and thanks once again to Steve Hanson, I am able to present such a routine for the tape version, which is as follows:

```
10 REM Arcadians infinite/extra lives
20 REM for Acornsoft Hits 2 version (BBC
tape)
30 REM by Hac-Man 1990
40 REM (C) The Micro User
50 REM
60 FOR I%=0 TO 2 STEP 2:P%=&900:[OPT I%
70 JSR 2416
80 LDA# &AD : STA &583E : \ infinite
lives
90 LDA# 3 : STA &4EBE : \ number of lives
100 JMP 16128
110 ]:NEXT:*FX 15,0
120 MODE 7:PRINT "Please
insert Arcadians tape, and hit a key...";
130 A%=GET:PRINT'
140 PROCload:CALL &900
150 END
160 DEFPROCload
170 !&970=&208D99A9:!&974=&8D09A902
180 !&978=&0EA90221:!&97C=&F42004A2
190 !&980=&A08FA2FF:!&984=&FFF72009
200 !&988=&04A20DA9:!&98C=&4CFFF44C
210 !&990=&4352412E:!&994=&53454441
220 !&998=&8A48080D:!&99C=&AD489848
230 !&9A0=&FE2903CA:!&9A4=&6803CA8D
240 !&9A8=&68AA68A8:!&9AC=&49486028
250 ENDPROC
```

I recently received a letter from Stuart Hills of Lockerbie, Dumfriesshire, enquiring about pokes for Superior's **Codename: Droid**. Well, Stuart, a very comprehensive set of cheats that should allow you to do whatever you want appeared in my April 1988 column.

They were actually written for the original stand-alone versions of Codename:Droid – but I understand that the Play It Again Sam 2 versions of the game are identical – the 5.25in disc versions certainly are – so Sam 2 owners should find them equally useful.

I have also received a letter that goes as follows: *Dear Hac-Man, I have the originals of* ***Airlift*** *and* ***Caveman Capers*** *on disc for my Master 128k. Please could you publish some routines to make them work.* It was signed *Rob Jones, Wales.*

Unfortunately, Rob, I don't own copies of either of these on disc, but if you'd like to send me yours – together with a stamped, self-addressed envelope – I'll see what I can do.

Edited highlights

Carl Dimelow of Chesterfield, Derbyshire, has pointed out a rather confusing misprint in the instructions accompanying the original release of Superior's **The Life of Repton**. In the list of screen editor codes the code for the first screen – BABY – is already filled in.

However, the number given is not actually the correct number for the BABY screen – it's the code for PRELUDE, the very first screen of Repton 3. The correct code for BABY is 15890, as given in the list of passwords featured in the August 1988 column.

However, when Life of Repton was re-released on Play It Again Sam 9, the edit code in the actual game had been modified to be compatible with the instructions. Very sneaky.

Great ball of fire

Regular readers may remember the July 1987 column in which I detailed how to amend the high-score table of Superior's Battlezone clone, Battletank. I recently received a letter in the same vein from James Riden of Cardiff, which describes how to generate a separate disc-based high-score table for Simon Heather's Archimedes game **Fireball II**.

To proceed, first make sure that the original Fireball II disc is not write-protected, then enter the following lines:

```
LOAD "$.!FireBall.FBdesigner"
100 DIM name$(15),sc%(15):PROCload
855 PROCsave
4000 DEFPROCload
4010 f=OPENIN "$.!FIREBALL.FBscores"
4020 FOR I%=1 TO 15
4030 INPUT #f,name$(I%),sc%(I%)
4040 NEXT I%
4050 CLOSE #f
4060 ENDPROC
4070 DEFPROCsave
4080 f=OPENOUT
"$.!FIREBALL.FBscores"
4090 FOR I%=1 TO 15
4100 PRINT #f,name$(I%),sc%(I%)
4110 NEXT I%
4120 CLOSE #f
4130 ENDPROC
SAVE "$.!FireBall.FBdesigner"
```

To make the start-up file of scores that will be modified as new high-scores are achieved, type in the following lines:

```
4071 DIMname$(15),sc%(15)
4072 FOR A%=1 TO 15:name$(A%)="Simon
Heather":sc%(A%)=500*A%:NEXT:PROCsav
e
```

When you have done this, press Control+Break, then Shift+Break to play the game.

I hasten to add that, as happens occasionally, I have not been able to check the accuracy of this routine with a copy of Fireball II – but I see no reason to doubt it.

➤

Still lost?

In last month's column I featured a routine to provide infinite lives for the version of **Labyrinth** featured on the 5.25in disc version of the Acornsoft Hits Volume 2. This was in response to a letter from a reader who had seen a similar routine for the Master Compact version in the February 1989 column and asked for an equivalent.

At the time I did not have access to any other versions, but Steve Hanson of Superior Software has come to my rescue and provided a cassette of Hits 2. Which means that for owners of this version the wait is over.

As usual, type in the following listing, save it on to a blank tape, type RUN and follow the on-screen instructions.

```
10 REM Labyrinth infinite lives
20 REM for Acornsoft Hits 2 version
(BBC tape)
30 REM by Hac-Man 1990
40 REM (C) The Micro User
50 REM
60 FOR I%=0 TO 2 STEP 2:P%=&900:[OPT
I%
70 JSR 2416
80 LDA# &AD : STA &3723 :\ infinite
lives
90 JMP 23808
100 ]:NEXT:*FX 15,0
110 MODE 7:PRINT "Please insert
Labyrinth tape, and hit a key...";
120 A%=GET:PRINT
130 PROCload:CALL &900
140 END
150 DEFPROCload
160 !&970=&208D99A9:!&974=&8D09A902
170 !&978=&0EA90221:!&97C=&F42004A2
180 !&980=&A08FA2FF:!&984=&FFF72009
190 !&988=&04A20DA9:!&98C=&4CFFF44C
200 !&990=&42414C2E:!&994=&48544E52
210 !&998=&8A48080D:!&99C=&AD489848
220 !&9A0=&FE2903CA:!&9A4=&6803CA8D
230 !&9A8=&68AA68A8:!&9AC=&49486028
240 ENDPROC
```

Back into Overdrive

In the April 1990 column I featured a couple of pokes for Superior's car racing game **Overdrive**. I mentioned in that column that I had not had a chance to test them on the Superior Collection Volume 2 versions, but in the meantime I have been able to check the cassette and 5.25in disc ones.

First type in Listing III from the April column, then make the modifications:

```
220 IF S%>0 AND S%<6 THEN
?&2448=ASC(STR$(S%))
230 ?&2569=ASC(STR$(C%
DIV10)):?&256A=ASC (STR$(C%MOD10))
```

If you own the disc version of the Superior Collection Volume 2, you should also make the following modifications:

```
190 PRINT "Please insert Overdrive
disc and press any key...";
205 *INIT
```

then save this final version, type RUN and follow the on-screen instructions

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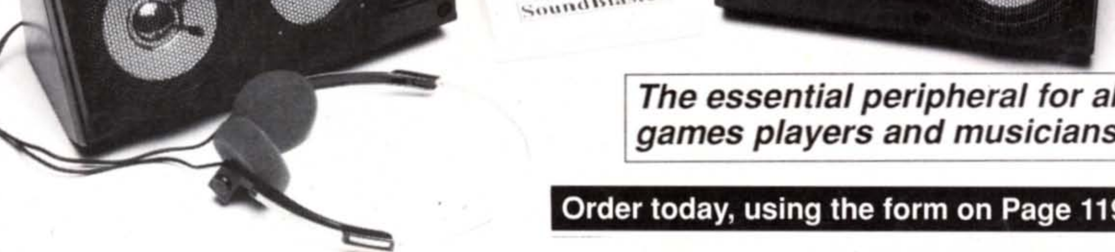

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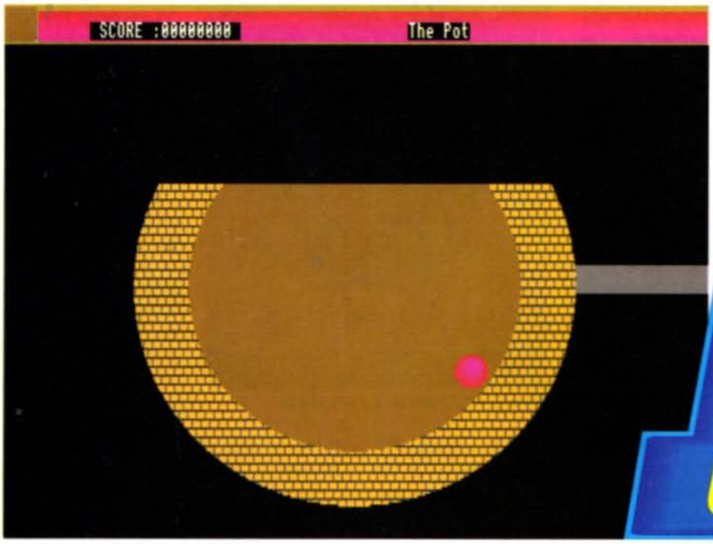

Stuart Tyrell brings back a popular program in a new guise

FOLLOWING their appearance in the animated Archimedes Bouncers program in the January 1989 issue of The Micro User, they're back – this time in Bouncers II: The Game. You take the role of an apprentice Bouncer on his way to an audition for a place in the Bouncers Ballroom Dancing Team.

But when you arrive all is not well – the evil witch has deflated all the Bouncers. Your task is to collect all the gas canisters inside and around the castle, and pick up the Ghetto Blaster. You can then go back to the room in which the Bouncers are held, and join them in their dance.

Full instructions are included. Just type in the program, ensure it's correct with the checksums, save it then enter RUN.

One major problem in writing games of this nature is ensuring the background stays intact while the player moves over it – or bounces off it, as the case may be. However there's a quick, efficient routine built into the operating system and even Basic which uses it:

```
RECTANGLE X,Y,Width,Height TO newX,newY
```

The one limitation is that it can only transfer the data from one part of the screen to another. With a sprite the size of the ball in this game, you hardly notice the small rectangle in the top left of the screen – a temporary data store. Watch it when you are trying to escape from The Pot.

Another point of interest in the program is PROCcmasks and the procedure it calls, PROCck. PROCcmasks creates masks for the sprites using "OS_SpriteOp" 29. It also provides the loops for PROCck which looks at the pixel at F,G within the sprite with the name specified. If the colour at this pixel is zero – the background – the corresponding point on the mask is filled in. These routines allow us to create masks for sprites without resorting to the sprite editor.

This fun Archimedes game can be found on the subscription disc for this month. Or you can obtain it direct from Stuart Tyrell by sending a formatted 3.5in disc and £2.00 to:

2 Woodside Ave, Moss Bank,
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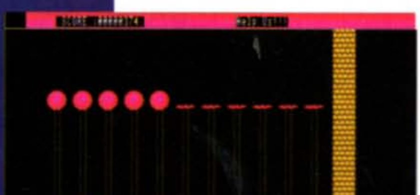


Rescuing the deflated bouncers

The conversions caper

Well-known games author Peter Scott reveals some of the secrets of his technique for squeezing quarts into pint pots

TO say that I specialise in converting games to the BBC Micro would be an understatement. Of my last eight games, seven have been conversions and there are another two lined up.

Doing a game conversion presents a completely different set of problems to creating and writing an original one. The main task is to decide what can go in and what has to come out – and the overall goal is to keep everything in.

Unfortunately most games originating on other micros are written specifically to take advantage of the hardware facilities they offer – such as the hardware sprites on the Commodore 64. Now it's even worse with converting games from 16 bit machines with 1Mb of memory, making my job even harder.

I try to avoid seeing too much of a game before agreeing to convert it. This may sound crazy, but if I'd seen some of the originals first I'd be doubtful that it could be done at all. Once the decision is made it *has* to be done – somehow.

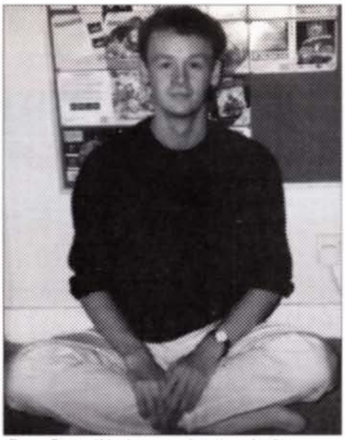
Some companies offer more help than others for the conversion. With **Barbarian** I was sent discs full of source code, a comprehensive cheat version, original graphics files and telephone help numbers. But, as it turned out, I used only the disc.

Since then all I insist on is a cheat version and complete solution – it's vital to play it through thoroughly to work out when, where and how everything is done.

Memory always presents the first, and most persistent, problem. A Commodore 64 has 60k to play with compared with the 25k maximum of a BBC Micro. Multi-loading doesn't help, as games are usually designed around set levels and load points that can't be changed. But luckily the original is often wasteful of space which can help – in **Predator** four lengthy 60k loads were reduced to just one of 25k.

Leaving memory aside, each game usually presents one special problem in the conversion process. Once that is cracked the rest follows naturally – if not easily. Here's some of the difficulties I've encountered and how I tackled them:

The first conversion I did was **Barbarian** – the highly rated *chop 'em up* on the Commodore 64. The main problem was this: How can the automatic opponents be controlled? Only by cheating. When the human player starts a move it's stored and the character goes through a sequence of up to 10 moves before the next decision can be made. So the micro-controlled opponent can be made to react as soon as the attack has been registered – instantaneous response and an unbeatable opponent. After this the difficult bit is fine-tuning it so that there's a gradually increasing level of difficulty. This process took almost as long as writing the game itself – everybody at Superior Software, as well as myself, played it hour after hour trying every possible way to fool the machine.



Peter Scott: "I insist on a cheat version"

The advert caused a stir, but in my opinion the only thing wrong was the hackneyed *rescue the woman* scenario.

The Last Ninja was the next job and it's one I'm still very proud of – the sheer size was daunting, with well over 100k brought down to 60k. The main obstacle was the 3D scenario.

The Commodore 64 used hardware sprites and an immensely complicated distortion routine to change 2D base graphics into 3D versions for display on the screen – it could take nearly 10 seconds for one screen. I scrapped all this and used sprites – lots of them.

If you watch carefully you can see that the Ninja hardly ever goes behind anything – which simplifies the programming tremendously. It can seem that his feet go behind screen objects – but they don't, they're just both the same colour, black. Pretty sneaky.

Next came **Barbarian II** which, I think, is one of the most graphically impressive games I've produced.

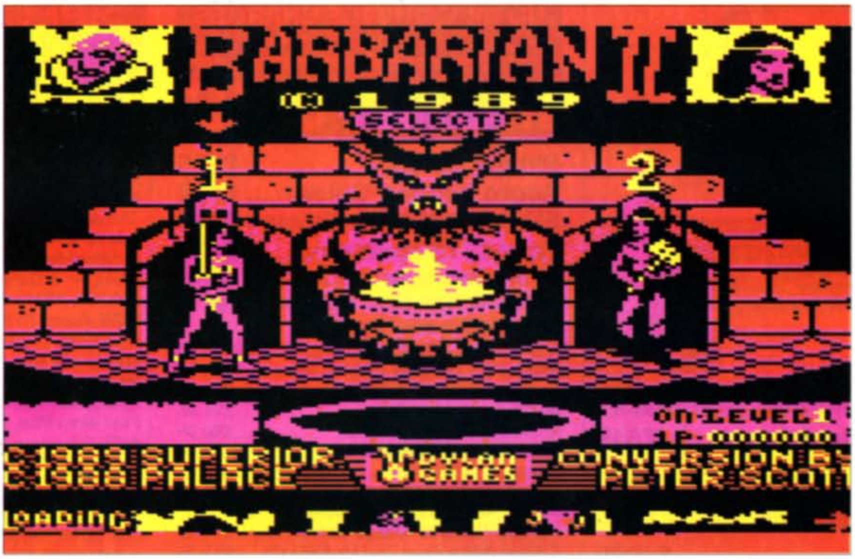
The programming involved in getting the massive sprites moving smoothly was the main task here. I ended up using compacted graphics expanded on to a backscreen then copied almost immediately to the display.

Storing the scenery proved very memory-hungry until I realised that all I needed to do was redraw the entire screen on the backscreen before putting the sprites on, then display it.

After that came the couple of hundred frames of animation – a very long job. The game solved the sexist scenario problem – you could play male or female – which doubled the graphics.

My first film license was **Predator**. Here the overriding programming problem was the parallax scrolling used – the foreground moves faster than the background – and the main sprites being in front and behind objects.

This was solved quite simply by using the backscreen to build up the graphics then transferring it to the display with hardware switching rather than software. The sprite routine was quite complex as it had to decide which to draw first depending on distance from the viewer.



"... the couple of hundred frames of animation were a very big job"

The first 16 bit conversion I had to tackle was **Ballistix**. Luckily the original was by Martin Edmonson who had written many BBC Micro games and he provided invaluable help. The difficult task was the movement of the main ball, working out the angles for rebounding smaller balls and having everything moving around smoothly and logically into the bargain.

The solution – as it often proves to be when programming for speed – was to use a look-up table.

It was very extensive and derived from mathematical formulae, mapping the speed and angle of any ball hitting another one. Momentum was then added and a lot of fiddly fine-tuning began.

Getting the screen to scroll pixel by pixel wasn't too difficult using a good sprite routine and the ubiquitous backscreen. The graphics themselves were a problem: Going from a 320x200 16-colour Atari ST screen to a 160x160 4-colour BBC Micro one. Compromises had to be made but 300k went down to 25k.

After Superior Soccer – my first non-conversion in many months – came **Last Ninja 2**. This was identical in form to the original but had twice as much graphics.

The answer was a highly efficient compaction routine which squashed the originals down to 40 per cent of their initial memory requirement. Re-writing old code proved to be hard – trying to remember which piece of code did which task.

Last Ninja 2 had lots more opponents and many more animated effects – in fact there are 100 frames for the main sprites alone – not counting 70 screens of detailed backgrounds.

And there was a bug, which was discovered the day before duplication – when I was visiting a friend in Scotland. It was mostly fixed after several hour-long phone calls, but I still had to come home early to finish the job.

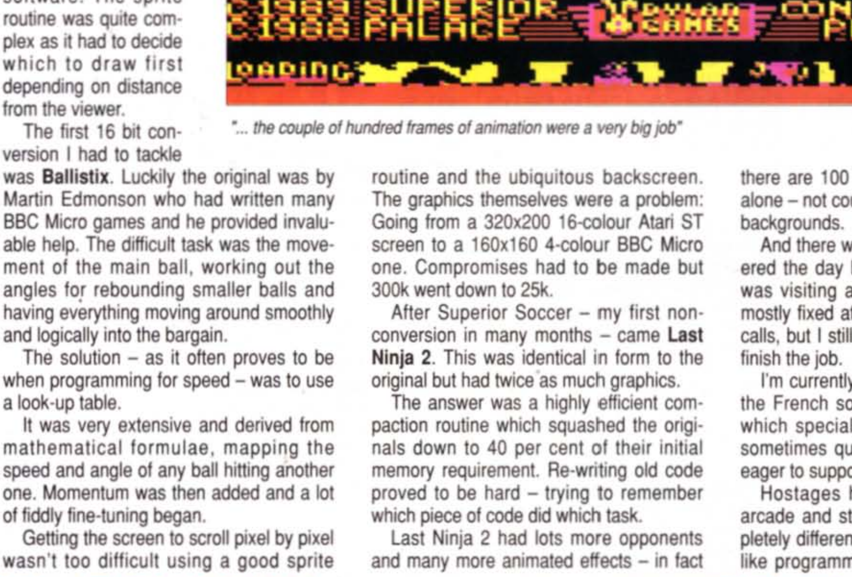
I'm currently working on **Hostages** from the French software house Infogrammes which specialises in highly original and sometimes quite strange games and are eager to support the Acorn machines.

Hostages has three levels involving arcade and strategic skills. Each is completely different in form and play – it's a bit like programming three entirely separate games.

After this comes **Sim City** which is a very nice strategy game where you take control of a city and have to build houses, provide services, cope with disasters and so on.

I feel that conversions are vital to keep the BBC Micro visible in the software market. The High Street stores are much more likely to stock a game with a recognisable name.

So if you want versions of games like *Operation Wolf*, *Robocop* and *Batman* from Ocean, or *Strider*, *Black Tiger* and *E-motion* from US Gold why not write to them? It's worth a try, and it keeps a certain programmer off the streets.



"Each level is completely different in form and play"

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Memory-saving custom screens

Barnaby Short tackles the persistent problem of memory shortage

ONE problem with the BBC Micro that many programmers have come across at one time or another is the trade-off between screen size, pixel resolution, availability of hardware scrolling and memory.

There are several parts to this problem, but let's consider how to minimise the vast amount taken up by Modes 0, 1 and 2.

Whatever way you look at it, you've got to cut down on memory used. The easiest way out is to reduce the amount of screen displayed and put some of your program code or sprites into the area of screen memory that isn't showing.

You do this by programming the screen display registers which control things as number of displayed characters per line. They can be used to program the 6845 CRTC – cathode ray tube controller – in such a way that a usable area of display appears on the screen, different in dimensions to that of normal screen sizes. Most commercial games use this system to help cram more in.

The registers can be programmed easily using a version of the multi-purpose VDU23 command:

```
VDU23;R,V;0;0;0;
```

where *R* is the register number and *V* is the value to put into it. This short program demonstrates how to set the screen start address:

```
10 newaddress=&4000
20 MODE1
30 PRINTTAB(0,0)"Hello"
40 REPEAT UNTIL GET=32
50 VDU23;12,(newaddress/8)DI
V&100;0;0;0;
60 VDU23;13,(newaddress/8)MO
D&100;0;0;0;
```

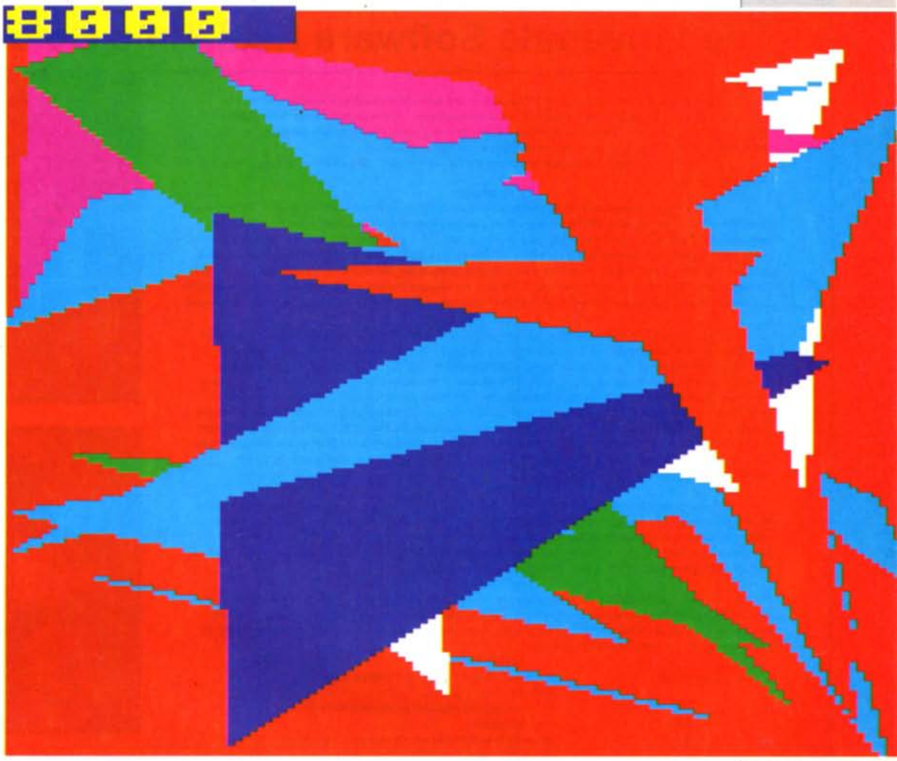
Unfortunately, using the screen blanking method alone doesn't let you perform that famous hardware scroll because the operating system will scroll the original amount of memory which was used by the mode before redefining the screen layout, and you end up not saving any memory.

The only way to alter the amount of memory shifted around by the hardware scroll is to write to the addressable latch which requires a more complicated approach than that to redefine the screen layout.

The hardware scroll facility within the BBC Micro is only capable of properly scrolling four sizes of screen mode – 8k, 10k, 16k and 20k – the size being set using two bits of the addressable latch.

The latch is stored in an interface – 6522 Versatile Interface Adapter – so can

➤



Bit	Operation
0	Write enable to sound generator.
1	Read enable on speech processor.
2	Write enable on speech processor.
3	Write enable for keyboard.
4,5	Control hardware scrolling.
6	Switch Caps Lock LED.
7	Switch Shift Lock LED.

Settings for the various hard scroll screen sizes:

Bits of latch 4	5	Screen size (k)
0	1	20
0	0	16
1	1	10
1	0	8

Table I: System VIA bits

PINEAPPLE SOFTWARE

The Pineapple Software Real Time Colour Video Digitiser

What is a Real Time Video Digitiser? There are quite a few different 'Digitisers' available for the Archimedes but very few can accurately claim to fit the above description. The requirements are that it must be able to 'grab' a single field of video information from a colour moving source, such as a video recorder, TV, or video camera, and then process the image and display it on the computer screen.

The Pineapple Digitiser does just this, – and at a price which is less than some Digitisers which can only handle static images.

HARDWARE

The hardware consists of a double width podule which fits inside a 300 or 400 series Archimedes, and comprises a PAL colour decoder, 256K memory and various control and interface circuitry. The PAL decoder converts the input signal from your TV or video recorder into separate red, green and blue signals. These are then converted into digital form and stored in the 256K ram in a format giving 512 pixels across the picture and 256 rows vertically. The video signal in the ram is constantly changing at the same rate as the incoming video picture until the podule receives a signal from the computer to 'freeze'. At this point the last picture in the ram is frozen and can be transfered to the computer screen in many different ways depending on which software commands are issued.

SOFTWARE

The software to drive the podule is supplied on disc in the form of a relocatable module. This provides a host of additional '*' commands and SWI's which can be used even by inexperienced programmers to produce very impressive displays of live pictures or ones previously saved on disc. For non-programmers, ready written programs are provided to explore all the features of the Digitiser and produce 'Sprite' images which can be used in many other applications and 'Art' packages. The software is very easy to use and scaling routines are provided which allow you to manipulate the grabbed image by selecting any part of the picture (using a box drawn on screen controlled by the mouse) and placing it on any area of the screen, again using a box to select the position and size. This enables multi-picture images to be produced very rapidly using either live pictures or ones you have previously saved on disc. The 80 page handbook provides full details of how to implement the commands even for the inexperienced programmer.

EDUCATION

The Digitiser has many uses in education. The software commands can show many of the effects typical of the digital storage of TV pictures which can help to explain the way in which TV works. It can also be used to produce powerful audio-visual displays tailored to your own requirements from images captured using video cameras etc. For younger children, programs can be created to help learning by giving high quality visual images of animals, birds, trees etc, built into a 'quiz' format. The possibilities here are endless.

FUN & GAMES

As well as showing off to all your friends who don't have an Archimedes, what a great computer it is, you can use the Digitiser to produce images for all sorts of games and visual demonstrations. Games such as 'Guess the Celebrity' or 'Guess the Advert' can be produced by even inexperienced programmers, simply by 'grabbing' all the necessary images from TV and saving to disc.

SPECIFICATION

Video Inputs	Pal coded video, .75 Volts – 2·5 Volts pk to pk R, G, B & sync input All inputs may be terminated by internal DIP switches.
Resolution	512 x 256 pixels
Storage system	Standard version 4 bits Red, 4 bits Green, 4 bits Blue – 192KRam Extended version 5 bits Red, 6 bits Green, 5 bits Blue – 256K Ram
Picture Area	The Digitiser harware allows the full screen area normally viewed to be stored in the podule ram. Horizontal shift, Vertical shift and width can be adjusted internally if required.
PAL Decoder	The PAL decoder provides manual control of Brightness, Contrast and Saturation, combined with full auto saturation control.

QUESTIONS & ANSWERS

Q – What is the difference between the 12 bit and 16 bit version?

A – The 12 bit version can produce very high quality pictures, those shown on this page were produced that way, but 16 bits can give even better results particularly in high resolution screen modes.

Q – Why have an R, G, B input?

A – For those who have professional video cameras capable of producing R, G, B outputs, the R, G, B inputs can give significantly better results than the PAL inputs by avoiding the coding-decoding process. This removes some of the defects of the PAL system such as cross-colour, and also reduces noise.

Q – Is a moving picture available?

A – Yes, you can show a real live moving TV picture on the computer screen. This means that if you are using a video camera or recorder as an input source then you don't need a separate monitor to frame up the picture.

Q –Will it work on the A3000?

A – Yes, but you need an inexpensive adapter box which we can now supply.

Q –Are the controls difficult to set up?

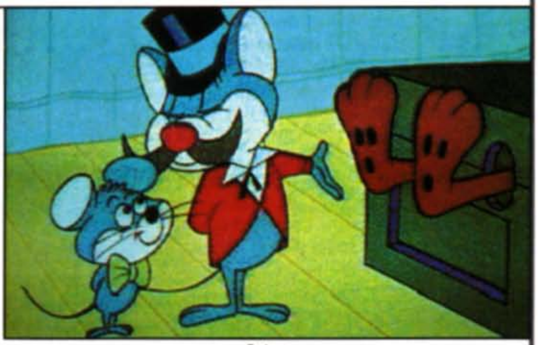
A –No, the three controls are exactly the same as on a normal TV set, Brightness, Contrast and Colour (Saturation). They may appear difficult to get at as they are at the back of the computer, but once set to your preference the brightness and colour should not require further adjustment, and the contrast (which is the easiest to get at) will only need adjusting if the video input source is changed.

Q –Does it take a long time to Digitise a full screen colour image?

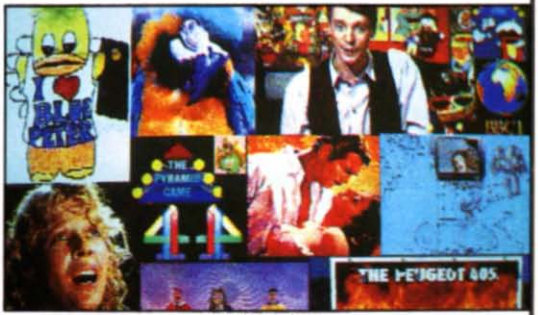
A –Not really, a full screen image takes just 6 seconds on a standard 310, and reduced size images take proportionately shorter times.

Q –What software commands are built into the module?

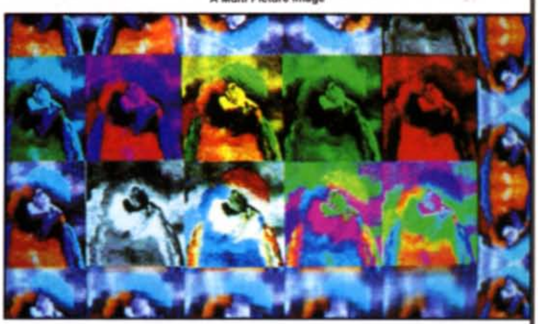
A –The software is under continual development and updates will be made available under our usual updating schemes (i.e) most updates are free), but the currently available commands are :- Average, Bits, Default, Digitise, Flip, Focus, Freeze, Image, Loadscreen, Loadsprite, Loadvideo, Mono, Moving, Negative, Noise, Outline, Palette, Primary, Restorescreen, SaveAIM, Savescreen, Savesprite, Savevideo, Screenarea, Setvideo, Unfreeze, Videoarea.



Cartoon



A Multi Picture Image



Some Digitiser Effects

– 'Pineapple has produced one of the 'ultimate' Computer Video Digitisers' –

–'The Pineapple Colour Digitiser looks to be one of the most professional products yet to be seen on the Archimedes'–

Acorn User – April 90

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'PCB Autoroute is remarkable. No similar software comes near the price.'

ACORN USER Aug 88

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ADU ....£29.00 P&P free

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Access

➤ only be programmed indirectly. In the simple listing below line 50 sets the eight I/O lines of the 6522 VIA to output. Then the two bits that make up the latch – which have to be programmed separately – are set in line 60 for bit 4 and line 70 for bit 5. The panel on the previous page gives a list of all the actions of this location.

```
 10REM The addressable latch
 20P%=&900
 30[OPT pass
 40SEI
 50LDA #&FF:STA &FE42
 60LDA #&0C:STA &FE40
 70LDA #&0D:STA &FE40
 80CLI
 90RTS:]
100MODE1
110CALL demo
```

A value being stored in &FE40 will enable you to set a bit of the latch after setting &FE42 to 255(&FF). It is found by taking the number of the bit – four – to be programmed, adding zero if you want the bit cleared or eight if you want it set.

It is most important when using this method to disable any interrupts with SEI and then re-enable them directly after with CLI, so that the bytes you are setting are not inadvertently corrupted by interrupts.

What we're going to do is select a screen mode of the resolution we want – Modes 0, 1 or 2 – then reprogram the latch to one of the smaller screen sizes to control the hard scroll and finally redefine a text window that correctly fits the display.

One drawback with resetting the screen width is that the operating system uses a look-up table of addresses to calculate where to print characters, plot points and so on. These consist of a table of values of starting addresses – to be offset from screen start address – for consequtive lines on screen, each value being stored hi-byte first. There's a pointer in zero page to the look-up table at &E0/&E1.

These can be altered to point to our own look-up table. Unfortunately this doesn't work on the Master or Compact which use calculation to plot each location.

Type in the program and ensure it is correct using the checksums then save it under any name except SCRCODE – When run it generates the screen definer code as SCRCODE. From your own programs just set the screen mode you want and run SCRCODE to set up the special format.

Lines	Actions
440-500	Return *Bad mode* if the routine is executed in the wrong mode – a bad mode is greater than two – and then set the text window size according to the mode used.
510-550	Set the hardware scroll to function with a 10k screen.
560	Execute the vectors that will not be reset by the CLS (LDA#12 JSRoswrch) in line 580.
580	Set the address of the new look-up table.
590	Set new line length to &200 bytes.
610	Execute vectors that need to be reset after a CLS.
620	Reset high byte of screen size of memory.
640-650	Compose a look up table of line lengths of &200 bytes.
680	Read the data for screen vectors.
700	Read the text window lengths 63, 31, 15 for Modes 0, 1, 2 respectively.

```
   10 REM Custom screens
   20 REM by Barnaby Short
   30 REM (c) The Micro User
   40 MODE2
   50 PROCdeclare
   60 PROCassemble
   70 $&900="*SAVE SCRCODE "+STR$~(codes
tart%)+" "+STR$~(codeend%)+CHR$13
   80 X%=0:Y%=&9:CALLoscli
   90 CALLscrform
  100 S%=&5800
  110 PROCdrawhiddenscreen
  120 PROCreset(S%)
  130 PROCdrawshowscreen
  140 REPEAT
  150 *FX21,0
  160 IFINKEY-73 PROCmove(+&200)
  170 IFINKEY-105 PROCmove(-&200)
  180 IFINKEY-67 PROCmove(-8)
  190 IFINKEY-98 PROCmove(8)
  200 IFINKEY-99 PROCreveal
  210 PRINTTAB(0,0);~S%;" ";
  220 *FX19
  230 PROCreset(S%)
  240 UNTIL0
  250 END
  260 DEFPROCreveal
  270 PROCreset(&3000)
  280 REPEAT
  290 UNTILNOTINKEY-99
  300 ENDPROC
  310 DEFPROCreset(s%)
  320 VDU23,0,12,s% DIV2048;0;0;0
  330 VDU23,0,13,s% MOD2048 DIV8;0;0;0
  340 ENDPROC
  350 DEFPROCmove(s%)
  360 S%=S%+s%
  370 IF S%>&8000 S%=S%-&2800
  380 IF S%<&5800 S%=S%+&2800
  390 ENDPROC
  400 DEFPROCassemble
  410 FORpass=0TO2 STEP2
  420 P%=codestart%
  430 [OPT pass
  440 .scrform
  450 LDA&355:CMP#3:BCC modechekskip
  460 BRK:RTS
  470 ]:A$="Bad mode"+CHR$13+CHR$0:$P%=A
$:P%=P%+LEN(A$)+1
  480 [OPTpass
  490 .modechekskip
  500 LDA&355:TAY:LDAtextlen,Y:LDY#83:ST
Adata,Y
  510 SEI
  520 LDA#&FF:STA&FE42
  530 LDA#12:STA&FE40
  540 LDA#13:STA&FE40
  550 CLI
  560 LDY#0:.loop LDAdata,Y:JSRoswrch:IN
Y:CPY#50:BNE loop
  570 TYA:PHA
  580 LDA#multitab MOD256:STA&E0:LDA#mul
titab DIV256:STA&E1:LDA#&58:STA&34E:LDA#
12:JSRoswrch
  590 LDA#0:STA&352:LDA#2:STA&353
  600 PLA:TAY
  610 .loop1 LDAdata,Y:JSRoswrch:INY:CPY
#85:BNE loop1
  620 LDA#&28:STA&354
  630 RTS
  640 .multitab:]
  650 FORa%=0TO23:b%=a%*&200:?(multitab+
(a%*2))=b% DIV 256:?(multitab+1+(a%*2))=
b% MOD 256:NEXT
  660 P%=P%+(30*2)
  670 [OPTpass:.data:]
  680 RESTORE 750:FORA%=0TO84:READ ?P%:P
%=P%+1:NEXT
  690 [OPTpass:.textlen:]
  700 RESTORE 850:FORA%=0TO2:READ ?P%:P%
=P%+1:NEXT
  710 codeend%=P%
  720 NEXT
  730 ENDPROC
  740 REM New screen vectors
  750 DATA 23,0,12,6,0,0,0,0,0,0
  760 DATA 23,0,13,0,0,0,0,0,0,0
  770 DATA 23,0,6,20,0,0,0,0,0,0
  780 DATA 23,0,7,28,0,0,0,0,0,0
  790 DATA 23,1,0,0,0,0,0,0,0,0
  800 DATA 23,0,8,2,0,0,0,0,0,0
  810 DATA 23,0,1,64,0,0,0,0,0,0
  820 DATA 23,0,2,89,0,0,0,0,0,0
  830 DATA 28,0,19,15,0
  840 REM Different text window lengths
  850 DATA 63,31,15
  860 DEFPROCdrawhiddenscreen
  870 PROCreset(&3000)
  880 FORT%=0TO&2800 STEP7:T%!&3000=RND(
&20):NEXT
  890 ENDPROC
  900 DEFPROCdrawshowscreen
  910 COLOUR129:CLS
```

➤

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```
920 COLOUR132:COLOUR3
930 VDU24,0;384;1018;1023;
940 MOVE0,384:DRAW0,1023:DRAW1018,1023
:DRAW1018,384:DRAW0,384
950 YS=1023-384
960 FORA=1TO20
970 GCOL0,RND(7)
980 MOVERND(1016),384+RND(YS):MOVER
1016),384+RND(YS)
990 PLOT85,RND(1016),384+RND(YS)
1000 NEXT
1010 ENDPROC
1020 DEFPROCdeclare
1030 oscli=&FFF7
1040 oswrch=&FFEE
1050 codestart%=&1100
1060 ENDPROC
```

All program listings in this issue can be downloaded FREE on...
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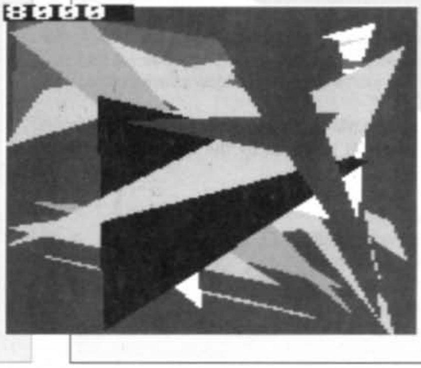

Get it right ✓

```
                                      410 =  E87 D   630 = 9843 0    850 = 205D C
                                      420 = 1CCB E   640 =  782 E    860 = 2CE7 E
 10 =    0 0    210 = 281F C          430 = 4E48 0   650 = C998 E    870 = 1B4B 4
 20 =    0 0    220 = 61AE F          440 = 6B46 4   660 = 97C8 1    880 = 1E7A 0
 30 =    0 0    230 = 60B4 C          450 = 496E D   670 = F904 3    890 = ED0F 4
 40 = DA59 9    240 = 53CE 5          460 = 674D 4   680 = 421A 6    900 = 5051 4
 50 = B363 1    250 = FD2E 8          470 = 9976 D   690 = 768B 9    910 = FE5C 6
 60 = 126A 9    260 = 5BEB 0          480 = 5BBE B   700 = 6512 D    920 = E649 1
 70 = 8851 0    270 = 1B4B F          490 = F2B1 8   710 = D964 0    930 = C52F 6
 80 = EE4B 9    280 = BFBA 5          500 = 65D4 C   720 = 2C83 4    940 = 366C 7
 90 = 3811 5    290 = 6FBF 8          510 = 2C4A 2   730 = ED0F C    950 = E0F9 5
100 = 7FD0 3    300 = ED0F 0          520 = 768E 8   740 =    0 C    960 = 9AE2 3
110 = 3361 E    310 = 55B0 4          530 = F976 1   750 =   69 2    970 = 79F6 F
120 = 60B4 A    320 = 9C22 6          540 = 9633 C   760 = 21FE D    980 = 4D4D 2
130 = CE71 E    330 = 2D93 9          550 = D5B1 6   770 = 7EC2 F    990 = 9F31 F
140 = BFBA 8    340 = ED0F 9          560 = C5F4 2   780 = DDBC 7   1000 = 2C83 2
150 = 2B9A 2    350 = 37D9 9          570 = 6E12 D   790 = C4EE F   1010 = ED0F E
160 = 264C 4    360 = 5A9E 2          580 = 8D00 E   800 = 798F C   1020 = 5EC5 A
170 = 2E88 7    370 = 6A22 F          590 = 771D E   810 = EE55 D   1030 = 7942 9
180 =  C31 3    380 =  9B6 9          600 =  330 B   820 = AD80 9   1040 =   78 6
190 = 1A0A C    390 = ED0F 3          610 = 3D3D C   830 = C720 0   1050 =  3C9 5
200 = B89C B    400 = 98E9 8          620 = E926 3   840 =    0 0   1060 = ED0F C
```

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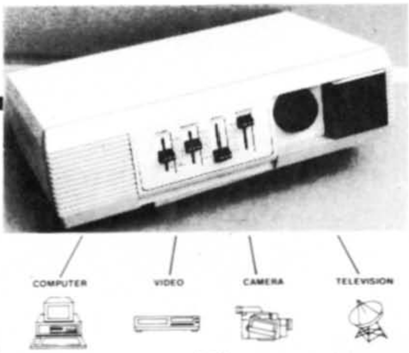

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PORTABLE COLOUR VIDEO PROJECTOR

PROBLEM Solved

Your technical questions answered by Mike Cook

Have a nice day...

I HAVE a BBC B issue 7 fitted with the Texas TMS 5220 voice synthesis processor and 6100 voice synthesis memory. There was an upgrade for the system from Acorn, but it is no longer on sale.

I would like to know how to connect the main circuit board of the unit to the keyboard circuit board of my BBC Micro and what other steps I could follow to operate this speech system to its full capacity. – **M.S. Al-hassan, Wimbledon.**

● *You need to fit a single sided 15-way edge connector socket to your keyboard, in fact there is room for two side by side. Then fit a row of 10 angled 0.1in spaced pins to the keyboard and finally fit a 0.1in pitched ribbon cable between this and the matching row on the keyboard.*

This will allow you to fit extra vocabulary roms, but unfortunately Acorn doesn't produce any. I did a Body Building article in the March 1985 issue of The Micro User *which described the extra vocabulary chips from Texas and made a board to fit them.*

Unfortunately, these chips are no longer available but I do have a few left, mainly the V6103 and the V6102. These are still available from Musbury Consultants at £25 each including gold plated PCB header to plug into the keyboard sockets.

The V6103 has 140 words mainly to do with weather and the V6102 has more than 200 words for general control. The major disadvantage is that they all have an American accent.

Topics on the agenda...

- ***Making your micro talk back***
- ***Using two joysticks***
- ***Taking the hiss out of music***
- ***Choosing the best 32 bit micro***
- ***Identifying the unknown rom***
- ***Linking into slower disc speeds***
- ***Nothing to hear on the tape***
- ***Using an Epson scanner***

Alien scanner

I have bought a secondhand Epson LQ2500+ printer with the Epson scanner kit no. 7392 along with two PC discs with the software to drive it.

The discs are useless, of course, but I was wondering if any software was available for the BBC Micro so that I can use it. I've tried Epson, Clares and Watford Electronics but no one seems to have any.

The scanner goes through the serial port, so I assume I could plug it into the RS423. Do you have any ideas? – Raymond Fanthorpe, Retford, Notts.

● *I don't know of any driver software either and I doubt any will be available. The problem is one of memory: A scanned image will easily take up many times the amount available in the BBC Micro – even with memory upgrades. A typical 8in by 10in image could require 300k. And even if you could grab the data and hold it somewhere there's no software to manipulate or print it.*

I'd try re-selling it for a profit and buying an Archimedes and a hand scanner.

Double joy for a micro

A few days ago I bought a pair of Acorn's joysticks but I've no idea how to use them. The User Guide doesn't explain about using the ADVAL command in this situation. Can you help me? – **Bahayaz Costas-Lawrence, Thessalonika, Greece.**

● *You can use two joysticks with the BBC Micro and the position of the each can be read with:*

```
X1=ADVAL(1)DIV64:Y1=ADVAL(2)DIV64
X2=ADVAL(1)DIV64:Y2=ADVAL(2)DIV64
```

This gives values in the range 0 to 1023. If these are switch-type joysticks rather than analogue you'll only get three different values – 0 on one side, 512 when centred and 1023 on the other side. To read the fire buttons use:

```
B=ADVAL(0)AND3
```

which gives zero when no button is pressed, one for for joystick one pressed, two for joystick two and three for both pressed. This information does not apply to the Compact.

Better music output

I OWN a Music 5000 and it is connected with a 5 pin DIN through the auxiliary socket of an old Sanyo G2511KL stereo unit to provide amplification.

This works fine, but when I try to record using the built-in cassette recorder the quality is very poor. There's a constant loud hiss which drowns out the music and it increases when I put up the output volume. Also the music only seems to come through one channel. The manual for the stereo says *"If the impedance levels of the input and output jacks do not match good recording quality is not possible"*. I've tried to record on a modern hi-fi too, but the results are the same. Is there any simple thing I can do to rectify this?

My second problem is that whenever I move my micro and Cumana disc drive from A to B then try to read a disc it always *chokes* and comes up with an error.

Sometimes a few bangs on the micro fixes it, but otherwise I have to open up the machine and move two wires away from the keyboard connector. It's very frustrating, as it can take anything from five minutes to half an hour to get the disc drive running again. – **Peter Wood, Glasgow.**

● *There's nothing unusual about the Music 5000's output and the warning about impedance matching refers to different frequencies being recorded at different levels – this can happen with a high impedance output driving a high impedance input. However the Music 5000's output impedance is quite low, so it should drive*

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➤

any tape recorder input without any problems.

It sounds as if you are not connecting the Music 5000 to the input of the recorder properly and the sounds you are recording are just some stray coupling inside the machine.

These combined systems often have strange signal switching arrangements and I suspect that when you switch to record the input it is being taken from another socket. Check the manual again or consult your dealer.

Your second problem is fairly obvious – it's simply a loose connection. Having said that, the hardest fault to track down is an intermittent one. Giving the micro a thump might solve the problem temporarily but it's a little too crude for diagnostic work.

A better approach is to move or tap as small an area as you can – starting with those two wires. Note what flexes when you move them and when the fault appears try to make it re-appear by doing the same thing again. In short, track down the break.

Three major suspects at this stage must be the disc controller chip's socket, the keyboard connection wires and the disc drives connection to the auxiliary power socket.

Unkillable bug

I USE my micro for business at home and have used Wordwise and Inter-Sheet for many years with no problems.

Last November I bought Inter-Base but this wasn't very successful because, although I could create the database when I tried to enter data, I got *Channel* and *Bad sum* errors and the disc was corrupted. At the time I had a Viglen disc drive with Viglen DFS. I sought advice from Watford Electronics and subsequently upgraded to Basic II, installed shadow ram and bought the Watford MkII 1770 DFS.

This didn't fix the problem and the machine was taken in for testing. Nothing could be found wrong but it was suggested there was a timing problem between Inter-Base (a pal-prom) and the micro itself – which would be impossible to cure. So I swapped Inter-Base for ViewStore and bought a disc drive with its own power supply.

When trying out ViewStore I created a fairly large database (66,000 bytes) and the problem returned. When entering data the *Bad sum* message appears for no apparent reason and that sector of data on the disc becomes corrupted.

Using the new DFS I've tried formatting at double density, single density, with 31 and 62 file directories, old discs, brand new untouched by a formatter discs – but all with the same result. Meanwhile Wordwise and Inter-Sheet continue to work perfectly.

Is it just that the database too big for the machine? – R. G. Loveday, Woking, Surrey.

● *The give-away here is that Wordwise and Inter-Sheet work while the databases doesn't. So what's the difference? The two packages that work load and save files in continuous blocks while both Inter-Base and ViewStore use random access filing. That means they move – at random as far as the drive is concerned – to a location within the data file to extract or insert information.*

With the experts at Watford Electronics you've already determined the problem isn't the disc drive, the disc controller chip or the driving software. The only thing this leaves is the speed at which the data is accessed.

On the bottom, right-hand side of the keyboard – inside the machine – are a series of links, some of which control the disc access times. These must all be unmade. You may find your disc drive makes more noise, but it should solve your problem.

Blank tapes

I have an issue 7 BBC Micro with Watford Electronics DFS but recently decided to play some of my old tape games. But although the *Searching* message appeared it didn't find anything.

It definitely isn't the cassette player, leads or tapes because I've tried them on other machines and they do work. So the tape system must be at fault – is there anything I can look for first before it having to cost me anything? – **Matthew Newton, Macclesfield, Cheshire.**

● *If the external hardware and tapes are OK that only leaves the internal hardware. There's very little chance that the CFS software is at fault because the rest of the operating system is functioning.*

Perhaps the most likely cause, if you've not been using the cassettes for some time – is that the socket at the back of the micro has become dirty. See if it will save anything to tape – this uses different pins but it might give some clue as to what's going on. Remember the software will claim that the save is going ahead OK so either use the monitor on your tape machine to see whether it's making the usual saving sounds or play the tape back afterwards to see what is there.

You could also be having trouble with the -5v line, but in this case the machine wouldn't beep when switched on.

The next suspect is IC35 – LM324. This takes the audio signal and converts it into digital form. It is possible to damage the input to this chip by playing the tape at too high a volume.

Finally, if this isn't the problem it must be IC7, the serial ULA, although if the RS423 is still functioning it's unlikely to be this.

Buying for the future

I AM thinking of upgrading to an Archimedes but can't decide whether to get a second hand A310 with colour monitor or a new A3000. Is the 10 per cent increase in speed of the new machine going to make much difference in the future? And is Risc OS on the A3000 any better than on an A310?

I also want to upgrade to a hard disc. How much would it cost for a low capacity hard disc, say 10Mb? What are the pros and cons of adding one to either of the machines?

IF I buy an A3000 I want to add an RGB modulator so that I can plug it into my TV – how much difference can I expect in quality? Will my current printer lead work?

Finally, can I perform small memory upgrades (32k to 128k) and plug them straight in or do I have to buy a separate board? – M. Folkard, Newcastle upon Tyne.

● *The increase in speed is barely noticeable, and replacing the MEMC chip in an A310 with the new MEMC1a provides the same speed-up.*

The Risc OS software is identical on both machines. The only difference lies in the fact that the A310 – and 400 series – can detect when a disc is put into the drive. This means that when Risc OS asks you to put in a disc it can recognise it automatically on an A310, but on the A3000 you have to click the Okay button in the window.

The A310 certainly has the edge for expansion as you can fit at least one hard disc and a second floppy drive internally. On the A3000 they have to be external. However a 10Mb hard disc is hardly worth the effort – you should start at 20Mb.

There is no way to add small amounts of memory. The A3000 has been engineered to be expanded only to 2Mb as standard, although there are several third party add-ons that will take it to 4Mb. These plug in easily. Plugging in the expansion cards for either 2Mb or 4Mb ram on the A310 is quite a task.

You can use an RGB modulator, but they are either very expensive or not very good. In my experience some low cost ones work well with certain makes of TV but badly with others. You will need a different printer cable.

Extra roms?

WHILE I was refitting a sideway rom into my issue 4 BBC Micro I noticed that the rom socket IC52 contained a rom. As I was always under the impression that the basic rom was fitted in IC51 what is this one? – S Walkinshaw, Glasgow.

● *IC51 is not one of the sideways rom sockets – it's the operating system. Your machine won't work without it.*

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Oxbridge Revisited

The Mad Hatter returns to the hallowed halls for enlightment

THE lazy hazy days of summer are well upon us now, gentle readers, and the mind meanders to such delights as the looming Long Vacation for Oxbridge types. Us redbrick denizens had to make do with about three weeks less, as I recall.

Anyway, it seems an appropriate time to begin my account of **Oxbridge** which is entirely due to the kindness of Colin Jack, the author of this elegant, fiendish and entertaining romp around the halls of academe.

I am going to start by presenting general comments from Colin which may well give some frustrated players an onwards boost. For instance, the mop – encountered quite early on – is, in fact, a metal detector.

This is something I failed to realise for a long time, and I made the mistake of regarding it as just another piece of scenery.

The mop will emit a beep whenever you enter a room containing treasure, so you can easily determine whether an object in any location has a points value or not. More importantly, you won't locate the buried treasure in the desert without it and, as Colin says, it is sensible to carry it everywhere.

Your score in **Oxbridge** is based solely on the value of the objects held in your hand or stored in the Trophy Room. The solution of a puzzle is rewarded with the appearance of a valuable object to add to your collection.

A nice touch here is the way the Programmer visits you periodically to comment on your progress. If you aren't making much headway you'll not appreciate what he says after a while.

There are eight mobile characters in the game. Apart from the Programmer you can expect to encounter Doctor Spooner, the Cat, American and French tourists, Richard Branson, a cyclist and a courting couple.

You have a choice of 23 different ways of getting killed in this adventure and I'll finish off this introductory session by giving the full list, since it may well get some of you on the move again.

- **Possible fatal actions:** Falling off the roof, annoying the bees, falling into the river, punting under the low bridge and catching a crab while in the punt.

You should also avoid attacking any troll, using the command BREAK, depositing litter in the Chess Garden or the leaflet anywhere but in the litter bin.

Whatever you do, don't leave the pub with the tankard, carry museum objects past the museum troll, or take any Harrids merchandise on to the stairway. You can't enter Customs without a passport or carry the Tequila through, either.

- **Repetitions to be avoided**: Digging more than one hole and visiting an Antarctic location more than once. These two clobbered me thoroughly.

More dangerous deeds include trying to go the wrong way through a matter transmitter and opening the radioactive box.

An open fume cupboard is deadly, as is entering the bank manager's office in possession of a stolen cashcard. Entering the wrong ID number on the service till keyboard isn't exactly healthy, either.

The last three fatal failures are to activate the weighbridge alarm in the museum, trying to transport yourself in the Harrids lift and attempting to enter the No Punters area via the bridge or the landing jetty. Keep all these in mind and you'll live a charmed life.

(More next month)

Home and dry with Erik the Viking

Abandoned readers who are following the **Saga of Erik the Viking** are in a hot passage which should have been familiar – but in case it wasn't, the way out involved locating the sleeping dwarves to make you realise that a spot of amulet rubbing was in order. That is the only way you can return to your ship, the Golden Dragon.

Your destination now is Jorvik's Wharf, which is reached by going S, E, E, S, S, E, E, S, S, S and W. Arm yourself with the scales, bracelet, bell and jar.

Make your way to the house – N, N, E and N – and help yourself to the cat. You'll be asked to cough up a couple of ounces of gold, so offer the bracelet and, when its weight is disputed, use the scales to verify its value.

Then take the cat, tie the bell to it and when the cat shakes it loose the noise will go into the jar. You have got one more of the items demanded by Al Kwasarmi.

Now it is time to travel back to the stone quay again, but before I give the moves you need to know something about a couple of important creatures who feature in this adventure.

Two randomised encounters occur while you are all at sea – you meet the dolphin and the dragon. The dolphin is happily blowing bubbles and is the source of the *breath of a fish*. You can fill the flask with it. OK, I know dolphins are mammals and not fish – and so do the Austins – but adventure games demand a pint of poetic licence from time to time.

When you encounter the dragon, climb up the mast but don't take anything with you or the dragon will sneeze. If that happens you'll finish up at a random location that could be just about anywhere in the game.

When you are up the mast you can enter the dragon's nose. Be brave about exploring and don't funk the maze. Inside is a tickly feather which you should take and then make your way back to the deck of the Golden Dragon. Now you should *look* – and you'll discover a whistle with a picture of the dragon on it. SAVE your position here and then BLOW the whistle. I'll leave you to work out when this device should be used.

If you have been careful, you now have everything that Al Kwasarmi demanded before he would help you, so E, N, N, N, W, W, W, W, S, S, S and S take you to the stone quay. I'll leave you to make your own way to the Throne Room.

Once there Al Kwasarmi will help himself to the objects he requires and after that you should look to discover a yellow ribbon. Take it and go back to your longship.

Your final destination is the farthest shore: E, N, N, N and W from the stone quay will get you there. Disembark and head for the rank grass, only taking with you the yellow ribbon and the mirror.

The mirror will sort out the dogfighters and enable you to encounter Fenris the wolf which is fast asleep. Tie the yellow ribbon on him, then Look, and you should be able to work out how to enter the prison and release your family.

I am sure all readers will be grateful to Tony Marter for a precise and beautifully worked out solution. Mind you, we wouldn't expect anything less from an officer in the Royal Air Force, would we?

The dodgy benefits of bountiful booze

Last month I left you with the workmen at the builders yard in **Dodgy Geezers** busy taking a tea-break. Now you should *Take Pickaxe* as well and head west.

Wait here – and repeat as necessary – until a bullion truck appears and then follow it SW, SE, S and NE along a dirty dark alley until you are by a warehouse.

Tweedle will now arrive to help you, but you won't be able to do anything because there is a policeman nearby. To avoid being arrested *Drop Pickaxe* and continue to follow the truck SW, N and NW back to Electricity Street.

The driver has entered the Korner Kaff, so follow him in (S) and *Wait* three times so that you can overhear his conversation on the public phone.

The driver will now leave and you must go N, SW, SW and S to Terminal Street where the truck is being unloaded. Go W into the Bank foyer and try to go W again. Although the guards will prevent you, this move enables you to see the crates being carried into the vault.

Now go E so that you notice a high wire fence to the south of you, and then return N, NE, NE, SE, S and NE to where you dropped the pickaxe, and you should find that it is Friday evening (turn 60).

It is time to move S into the Warehouse and *Wait* as you hear the car outside. This will enable you to overhear a conversation and so gain you the information that Soapy will be in the club later. Now *Search warehouse* to find the tarpaulins, *Lift Tarpaulins* to reveal the crates and *Open Crates* to find that they contain nails.

Make sure that you leave everything exactly as you found it: I didn't the first time I played the game and finished up rather dead.

Having made everything tidy, proceed N, SW, N, NW to Electricity Street and be prepared to *Wait* until the Frog and Peach opens.

When you can, go W into the pub and then W into the snug where you should *Take matches* and then *Examine* them to find that there is only one match left. Lastly, *Examine box* to see the advertisement for the Swordfish Club.

Next move NE to the public bar – note the phone – and then S and E to Electricity Street. Now go NE and W to where you left the money, *Take money* and go up to outside the nightclub.

Knock to gain admittance once you have provided the password – Swordfish – and you'll see Soapy. *Buy round of drinks* and Soapy will ask some questions, *Say Nails* and then buy another round to get more information from Soapy.

Buy a third round and Soapy will invite you next door so go E to the empty function room and buy one more round to get Soapy to tell you about the Sewers. Buy a last round of drinks to render Soapy senseless and call it a day.

(To be continued)

➤

Hatters helpline

I have just been deluged with a flood of readers' letters and I want to issue a reminder. You *will* get an answer eventually. I deal with letters that enclose a stamped addressed envelope first and then the rest as space in the column allows.

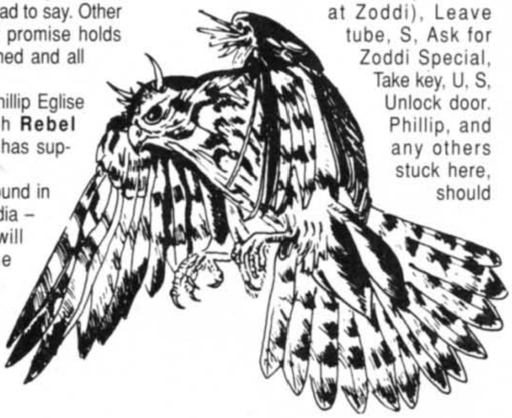
If I have answered a question identical to yours in a recent column, and you didn't enclose a SAE, then I reckon you have already seen what I have had to say. Other than that, the Mad Hatter promise holds true: All letters are welcomed and all get a reply – some day.

In the March column, Phillip Eglise needed some help with **Rebel Planet** and Barbara Gibb has supplied the answers.

You give the tickets – found in the airlock location of Caydia – to the Arcadians. They will then leave, dropping the wrench as they go. Barbara uses the input: Talk to Arcadians, Take tickets from Kube, Give tickets Arcadians, Take wrench, Drop wrench into Kube.

To ride the tube on Halmuris, Phillip needs a pass, and Barbara recommends the following input sequence: Insert card into Computik, Take card, Drop card into Kube, Take (travel) pass, Wait (until Tube arrives), Enter tube, Drop pass into Kube (the collector will confiscate it if you carry it openly), Read advert – which tells you about the Zoddi Special.

Then Wait (until back at Zoddi), Leave tube, S, Ask for Zoddi Special, Take key, U, S, Unlock door. Phillip, and any others stuck here, should now safely be in Room 110.



I had an unexpected – and very welcome – phone call the other day, from none other than Geoff Larsen. Geoff is not only enjoying married bliss hugely, but he is also now the besotted dad of a bouncing baby boy.

The purpose of Geoff's call was to let me know his whereabouts since they moved recently. Although Geoff no longer has the time to write adventures, he is still finding that there is a demand for his old games and he is very willing to supply copies to anyone who writes to him at 25 Lancashire Road, Bristol BS7 9DL.

Of course, what the adventuring world still needs is someone to take over Geoff's mantle. Geoff wrote his games using the Quill utility, but now this has been superseded by Alps so far as the BBC Micro and Archimedes are concerned.

I reviewed an Alps adventure in the spring – **Cops** – which showed very clearly what can be done. So why don't some of you let your imagination run riot and see what you can do?

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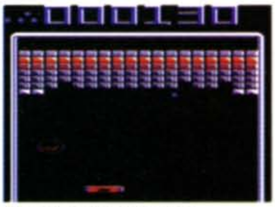
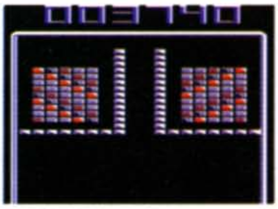


Knock out the bricks in Hyperball



One of the 120 Hyperball screens

Unlucky for some?

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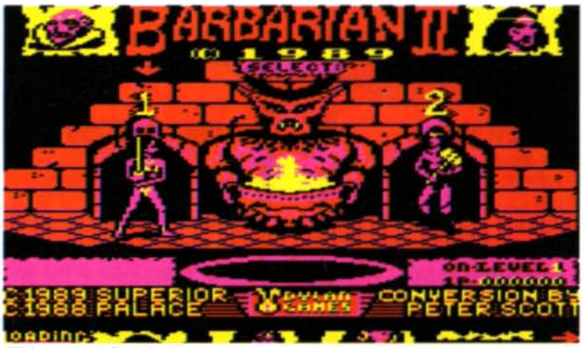
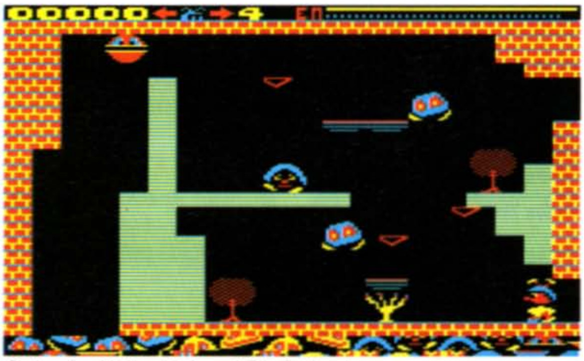
SUPERIOR Software certainly shows no signs of superstition as it launches number 13 of what is easily the longest running series of game compilations for the BBC Micro. Four more programs from the recent and, more distant, past – two of which were coded by the ubiquitous Peter Scott.

Hyperball is of the Breakout genre – you'll probably remember that Breakout revival a couple of years ago. When straightforward brick busting gave way to a more sophisticated game with feature bricks and bonus levels Hyperball is one such.



Kill the monster in Barbarian 2



Pandemonium: A highly polished example Peter Scott's work

With a comprehensive set of feature bricks at your disposal you could be forgiven for thinking that the game was going to be a piece of cake, but don't you believe it.

Combine this degree of difficulty with the fact that there are 120 different playing arenas to complete and you could be faced with hordes of frustrated Hyperballers.

Catching a dislodged feature brick activates one of the eight possible special effects, the majority of which work in your favour: Catching the Detonator brick allows you to split the ball into eight fragments with a press of the Return key. This is most effective if you have just manoeuvred your ball behind the wall.

The Slowball brick is self-explanatory, as is the Stickyball one. Infrared changes the colours used on the screen, thus making otherwise invisible bricks visible again.

A little firepower is introduced with the inclusion of a Laser brick. Indestruct increases the mass of your ball, giving it the ability to effortlessly plough through even the most robust of brick walls.

The Smartblock is a bit of a sneaky inclusion, if you are able to collect three of these special pieces of masonry without losing a life you can move straight on to the next arena.

This all sounds hunky-dory until you begin collecting these blocks. I am certain that the program deliberately drops them in such a way that you are tempted into lunging for that third elusive block, inevitably losing a life in the process.

The final variety of brick is disguised as an alien and, if collected by accident, has unfortunate effects on your bat.

A touch-of originality is injected between rounds. The successful completion of an arena is rewarded with a simple bonus routine. A flashing bat appears on the screen, all that you have to do is press the spacebar when the bat is visible and you earn yourself some bonus points.

OK, so it's hardly an Earth-shattering bonus round, but what is useful is what you can do with your points once you have won them. If you aren't too concerned about achieving immortality in the high score table you can trade them for three types of laser cannon, a warp drive or an extra life.

Hyperball is one of the biggest and most original Breakout clones for the Beeb, and a most worthy inclusion in this compilation.

Pandemonium is unmistakably from the keyboard of Peter Scott, the prolific author of countless platform games – most of which look just like this one.

On this occasion you are faced with the task of collecting all 12 parts of a *core*, the instructions are pretty vague so we must assume that some sort of nuclear reactor is involved.

Pandemonium is a highly polished example of Mr Scott's work. As usual, lateral thinking should be used at all times. Identify the most logical route from A to B then ignore it completely, select what appears to be the most unlikely of directions and you won't be far wrong.

One final feature worthy of note is the phone box teleports, which can provide a speedy means of transport in an otherwise hostile environment.

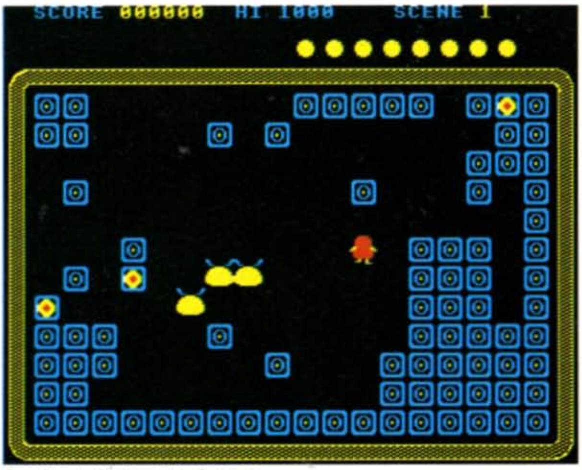
The only snag is the fact that you must know the code number of your destination teleport before you can activate the device. In other words, you have got to have reached the far teleport on foot before you can take a short cut.

This is not a program that pushes back the frontiers of platform gaming, but what it does it does well.

Percy Penguin is a version of a game that was a moderate success in the arcades way back in the mid-eighties. Unfortunately it isn't the best of the arcade conversions that reached the BBC Micro.

Play is set in a maze-like arctic wilderness constructed from blocks of ice. This inhospitable landscape is inhabited by Percy Penguin and a swarm of Snobees – stinging creatures with an insatiable appetite for penguins. The aim is to rid the maze of Snobees, the numbers of which increase as you progress through the levels.

Using a combination of careful positioning and some pretty good timing, you can



Percy Penguin: Can Percy kill the Snobees?

help Percy purée the Snobee population using ice cubes.

As a game, Percy Penguin falls down in several areas: Response to the controls is very poor, the fluidity of the action suffers in proportion to the degree of on-screen activity, and finally, there is no indication as to where the new Snobees will appear.

In the original game the inactive Snobees were encased in blocks of ice, therefore you knew where to stand before killing your next one.

In this version the newly-hatched bees appear at random, but more often than not, "random" is right beside Percy and you're minus one more life.

Sam's fourth and final tid-bit is **Barbarian 2**. In the first episode of this hack and slash extravaganza Mr Barbarian took on all comers in his valiant bid to free Princess Mariana, – alias the curvaceous Ms Whittaker – from the clutches of the evil Drax.

Drax escaped justice and fled to the deepest recesses of his lair. If the world is to sleep easy in its bed then the Barbarian or Mariana must venture forth into this hostile land and seek out the cowardly Drax. As we join the game it is decision time and you must choose who shall enter Drax's domain.

Barbarian 2 employs a different format to the original game, the straightforward fight to the death has been replaced by an arcade/adventure type scenario. The game is still packed full of hacking and slashing, but this time you also have to walk about and find objects.

The Drax domain is quite extensive, spread over four levels with roughly 26 screens per level. An additional element of difficulty is introduced in the form of changes in direction as you step from one screen to the next.

It may appear that you have merely moved by one screen to the right, but don't you believe it, if you keep an eye on the compass arrow at the bottom of the screen you will find that you have turned through 90 degrees. As the instructions state, a map is pretty useful if you are to collect all of the objects and then find your way to the exit.

Keyboard controls are used throughout. They are extensive, complicated, and one of the biggest difficulties that you will encounter when playing the game.

Our hero or heroine can perform six directional activities and four aggressive moves, the latter initiated by pressing the Return key plus one of direction keys.

For a long time I found myself turning around or jumping into the air when what I really wanted to do was to decapitate my opponent with a flying neck chop.

Most of the humanoid opponents have been replaced by horrible creatures that snap and bite, plus an oversized yellow dinosaur with a taste for muscle persons.

Various objects must be collected en route, and many have magical properties without which your quest is doomed. The orb and the shield guard against instant death from Drax's magic and the demon's fire, while other trinkets boost the usual parameters such as strength and resistance to damage.

Barbarian 2 gives you very little time to ponder your current predicament. If you stand around for more than a couple of seconds there is a puff of smoke and some slobbering beast starts lumbering in your direction. How you are supposed to sit with pencil and paper and map each level I don't know, I spent most of my time running from screen to screen trying to avoid monsters, rivers and those infernal bottomless pits.

It would appear that Superior have come up trumps again with yet another cracking compilation. Thirteen may be an unlucky number for some, but certainly not for Sam.

Jon Revis

Sound	*7*
Graphics	*8*
Playability	*8*
Value for money	*9*
Overall	*8*

BUG HUNTER + MOON DASH

Have twice as much fun

Price: £17.95
Supplier: Minerva, 69 Sidwell Street, Exeter, Devon 3X4 6PH
Tel: 0392 437756
Requirements: Archimedes series or BBC A3000

IF you enjoy a light hearted jaunt get Bug Hunter, which revolves around what was supposed to be an eight foot killing machine but, due to an error turned out as a six inch biped with a large mouth and an insatiable dislike of insects.

Can this mutant reject show its value as an insect exterminator? Well, various insecticides are easier to use, but they are not half as much fun as the likeable little red chap who is the star of this game.

Colourful loading screens and well thought out sound systems fuel expectancy as you read the instructions. The keyboard or mouse can be used to control the direction of the Bug Hunter – a nice touch by author Ian Richardson.

Starting at the hallway of the first house, the object is to control the Bug Hunter, which has suckered feet and can walk up walls and on ceilings, to pick up objects which he can then drop on to the insects to crush them.

After completing one room, a hole in the wall takes BH into the kitchen. Wonderful graphics here make the well-known brand of cornflakes on the table look lifelike. Drop the milk bottle on to two insects and through you go to the hall and stairs.

The game becomes progressively harder as differing rooms are debugged, but each screen is a delight in its detail, the pictures on the wall, the dressing room oddments on the bedside table.

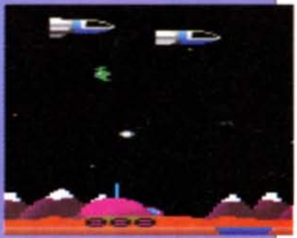
I particularly liked the realistic sound of a coiled spring being released as our mighty midget jumps from one place to the next.

This game is a must for young and old alike – it's so captivating that I had to fight the children off the A3000 to write this review. My 12-year-old daughter, an expert in such matters, says Bug Hunter is the best thing since Repton.

Moon Dash, by the same author, is a variation on the space invaders theme but with a difference. You drive a small moon buggy along the planet's surface trying to get to the next zone before being bombed or shot at by well drawn alien craft.

Zone become increasingly difficult, with more things being thrown at you by the aliens and booby traps on the ground to be jumped over.

Once a zone has been completed the password for it can be noted and the zone accessed from the menu screen without having to go through all the previous screens again.



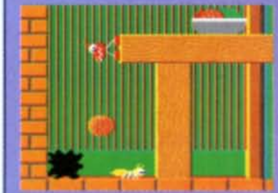
Under attack

Good sound effects and musical accompaniments make for great fun, particularly for children, although their elders can enjoy this well presented game too.

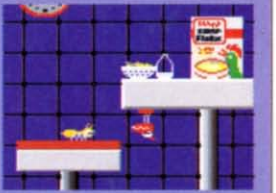
This double feature disc is excellent value and I would expect the Bug Hunter *Hysteron Proteron*, to become as much a cult figure for Archimedes users as Repton was for the BBC. Full marks to Ian Richardson and Minerva.

Baz Racon

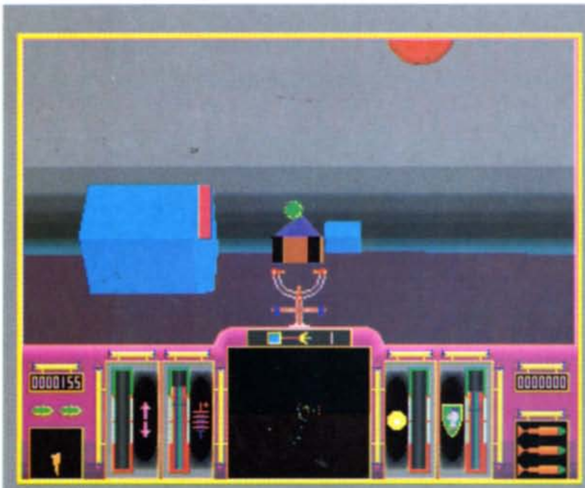
Sound	***7***
Graphics	***10***
Playability	***8***
Value for money	***9***
Overall	***9***

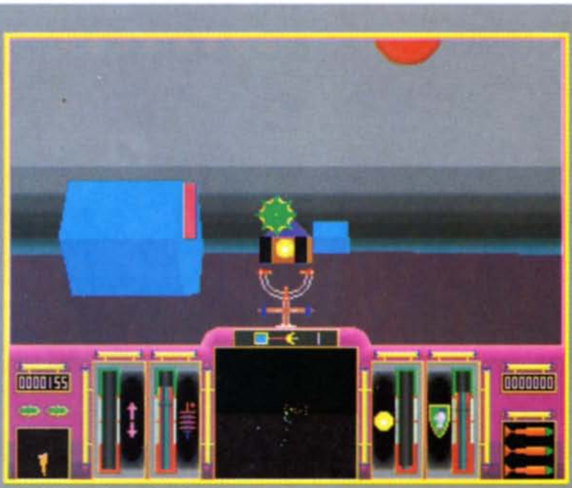


Bombs away...



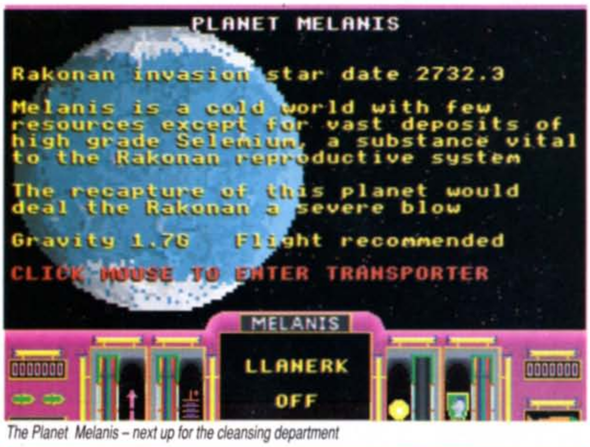
...meet thy doom


They're firing...


...straight down the gun barrel...

APOCA

.. real firepower


PLANET MELANIS

Rakonan invasion star date 2732.3

Melanis is a cold world with few resources except for vast deposits of high grade Selenium, a substance vital to the Rakonan reproductive system

The recapture of this planet would deal the Rakonan a severe blow

Gravity 1.7G Flight recommended

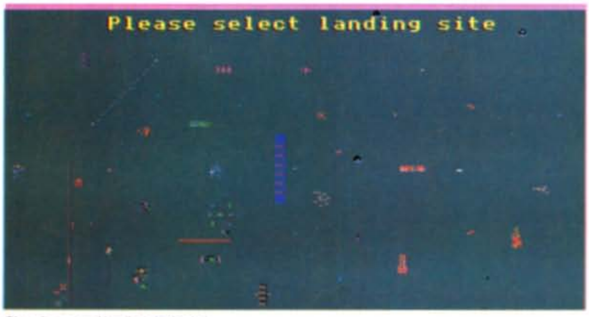
CLICK MOUSE TO ENTER TRANSPORTER

MELANIS

LLANERK

OFF

The Planet Melanis – next up for the cleansing department


Please select landing site

Choosing a good landing site is vital

Price: £29.95
Supplier: Fourth Dimension, Dept. 4444, 1 Percy Street, Sheffield S3 8AU
Tel: 0742 700661
Requirements: Archimedes series or BBC A3000

GORDON Key ranks as one of the best games programmers for Acorn machines – his versatility with the quirky puzzler Clogger (BBC Micro), golf simulation Holed Out (BBC Micro and Archimedes) and car racing E-Type (Archimedes and soon to be on BBC Micro) has now been confirmed with the stunning speed of the vector graphic 3D shoot-'em-up Apocalypse.

In the game scenario computers – now called the Rakonans – have evolved and started to undertake their own colonisation. Unfortunately their technique is to wipe out all carbon-based life and mine the entire planet to a state of complete destruction.

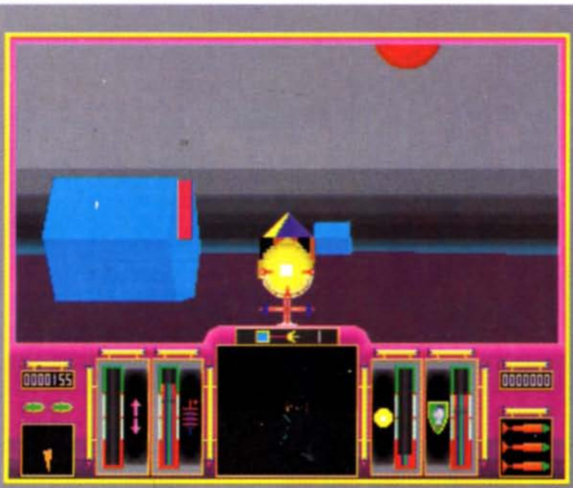
Your task is to wipe out enough Rakonans so that they can no longer support themselves and will die out. There are eight planets to take on with the usual in increasing order of difficulty. The first step is to choose a planet. Initially you are limited to Occaris but after one has been wiped clean it becomes available as a starting point for the next game. After many hours of playing I've only succeeded in clearing the first two worlds before being splattered.

Next you are treated to the animated approach of the planet using Gordon's extremely fast sprite scaling routine. A few details about the planet appear and you can choose where you want to land.

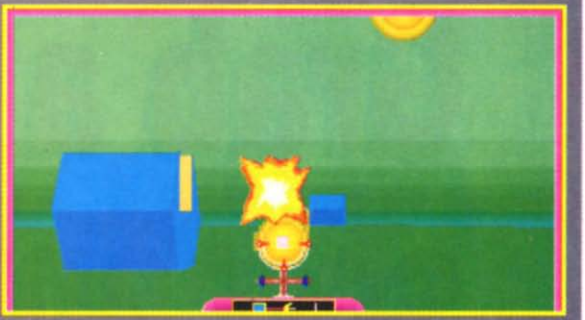
Your vehicle – called a Llanerk – can drive along the ground, fly to a limited height and fire fairly effective bolts of energy. It can also fly backwards.

Descent to the surface brings the first view of the 3D effects. Then if you are near a built-up area all hell breaks loose. The green dots on your radar screen are incoming energy bolts and just about everything except buildings and process-

Grounded flyer



...Fire!



We're hit!

LYPSE!

ing factories can shoot at you – your immediate concern on landing is to wipe out those.

On the first planet these are the Guard Towers. The best technique is to approach one slightly to one side of it to spoil its aim, then fire a salvo of energy bolts and swerve away.

If you have nerves of iron and a good aim you can try blowing them up from a distance while driving straight at them. The resulting explosion is superb – as is the accompanying sound effect.

Shortly after you arrive you will note an escort of little brown dots on your radar scanner. They are flying saucers which drop a pattern of energy bolts and keep dodging sideways, making them difficult targets.

Although they're not very dangerous individually, or even in groups, a combination of something nasty knocking your shields down along with being hit by a pile of bombs will eventually finish you off.

However you do own three smart bombs which will take out most of the saucers in the area. You don't score any points for doing so, but downing a saucer recharges your energy banks – handy for prolonging your stay on the surface.

You only have one life, but when your energy banks become too depleted to continue you can return to the main ship, where the Spacing Guild will assess your progress. If you haven't scored enough points you will be retired and have to start again.

An average score lets you continue, but the Guild will only permit such progress for a few trips. If you don't stop the Rakonans on a particular planet fast enough you are retired.

Scoring well in the early stages gives you ship upgrades including a supercooler for the gun, an Anti-Inertial Direction Bender and better shields.

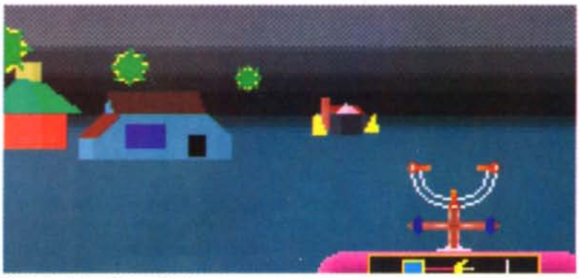
The between-levels graphics are adequate but not brilliant – Impact would do well to bring in a graphics artist to match Gordon's programming talents. All major games on other 16 bit micros are put together by teams of specialists.

Each planet has its share of unique creations – Seismic Hammers, Electron Grinders, Photon Flappers, Thermal Risers, Snail Herds – to shoot at.

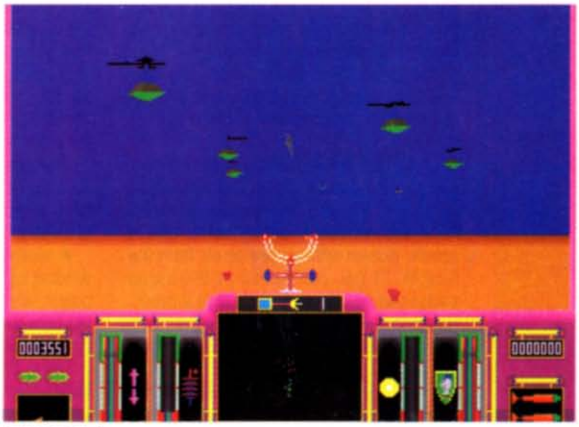
The programming of Apocalypse is superb and the gameplay excellent. It is in the high price bracket but certainly ranks in quality with Interdictor. Brilliant.

Steve Turnbull

Sound	***10***
Graphics	***9***
Playability	***10***
Value for money	***10***
Overall	***10***



Under attack from Electron Grinder



Apocalypse now?

Grab a screenful of colour

Ian Whitmore tries out one of the latest video digitisers

Product: Hawk V9 Colour Digitiser
Price: £339 plus VAT
Supplier: Wild Vision, 6 Jesmond Road,
Newcastle-upon-Tyne NE2 4PQ
Tel: 091-281 8481

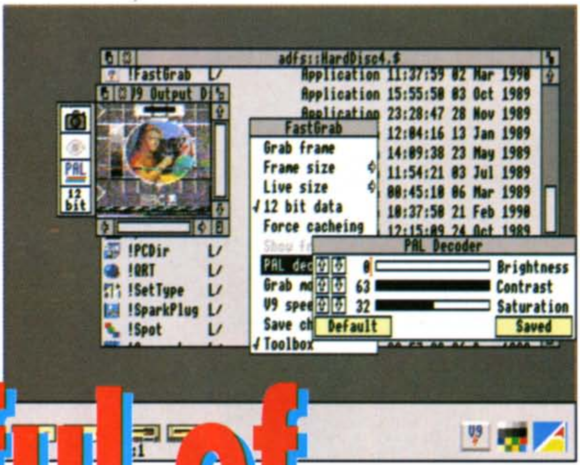

adfs::HardDisc4.$
!FastGrab
V9 Output
Application 11:37:59 02 Mar 1990
Application 15:55:50 03 Oct 1989
Application 23:28:47 28 Nov 1989
12:04:16 13 Jan 1989
14:09:38 23 May 1989
11:54:21 03 Jul 1989
00:45:10 06 Mar 1989
10:37:50 21 Feb 1990
FastGrab
Grab frame
Frame size
Live size
√12 bit data
Force cacheing
PAL
12 bit
!PCDir
!ART
!SetType
!SparkPlug
!Spot
PAL Decoder
0 Brightness
63 Contrast
32 Saturation
Default
Saved
√Toolbox

Figure I: Live viewing window with control menu

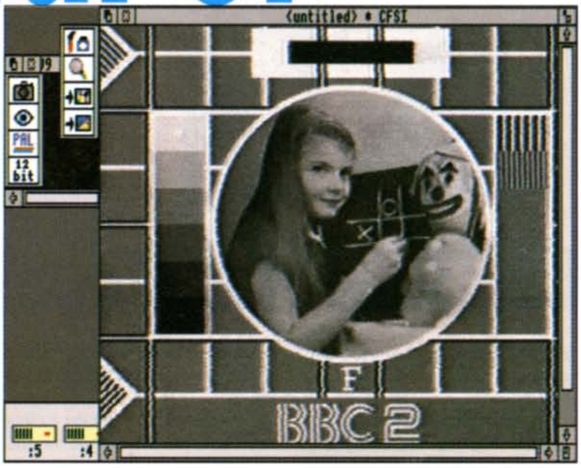

(untitled) • CFSI
PAL
12 bit
F
BBC 2
:5
:4

Figure IV: Mode 0 monochrome image

THE field of video digitisers for Acorn machines has long been dominated by Wild Vision and its latest offering – the Hawk V9 – joins a long line of professionally built units for grabbing frames for video sources from cameras and recorders to live transmissions.

The Hawk V9 is double width, has only one BNC socket on its rear fascia and, as always from this company, is of the highest quality.

Only three hardware selections or adjustments can be made. The video input termination resistor link can be removed. Pixel aspect ratio – factory set to give a square picture with square pixels from the middle 75 per cent or so of the video image can be altered by adjusting a potentiometer. And removing another link selects where in the frame picture digitisation begins.

Altering pixel aspect ratio can give rise to problems, so most users would be best advised to leave these three adjustments alone. Installation couldn't be easier, as the expansion card is happy in either upper or lower slots.

The software occupies just over 100k on a single floppy and consists of a single desktop application – !FastGrab, which includes Roger Wilson's ChangeFSI routines, allowing considerable amounts of image manipulation.

Running the application opens a small window on the desktop – see Figure I – which displays a regularly updated view of the video input.

The speed of update is dependent on how busy the machine is – as !FastGrab is fully multi-tasking – and the size and mode of display.

A toolbox attached to the side of the window can be used to grab a frame, display it, alter the PAL decoder settings and flip between 8 and 12 bit data when grabbing frames.

Using the mouse menu button opens a larger menu that duplicates all the toolbox settings and also sets frame sizes, grab mode, and V9 speed.

As the V9 is processing graphic information continuously for the live display window it may slow down other multi-tasking applications, so things have been arranged for you to reduce the percentage of time allocated to it.

Both live and grab frame size are user-selectable, giving images 512x256, 256x128 or 128x64 pixels in size. Keeping the live display size small maintains the display speed, but the larger sizes are useful for focussing.

Images can be grabbed in any graphics mode, but this is best done in Mode 15, which gives 256 colours and comparable resolution to the V9. Multisync owners might be tempted to grab in mode 21, but this has a greater resolution than the digitiser, so it gives a noisy picture. It is far better to use ChangeFSI to convert the finished sprite to mode 21.

When a frame is grabbed it is displayed in another window – shown in Figure II. If you are running the DeskTop in a mode other than the grab one the display may look a little odd. However the grab window has another toolbox, which gives access to

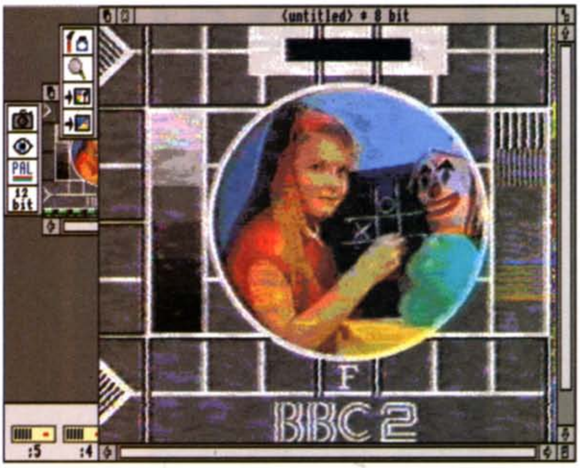
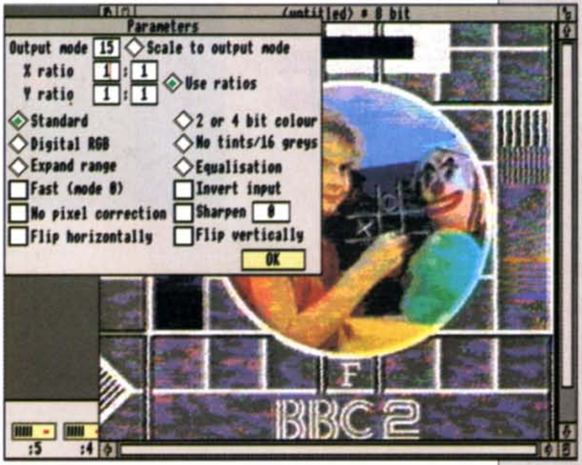


Figure II: Grabbed frame



Parameters

Output mode 15 ○ Scale to output mode
X ratio 1 : 1 ● Use ratios
Y ratio 1 : 1
● Standard ○ 2 or 4 bit colour
○ Digital RGB ○ No tints/16 greys
○ Expand range ○ Equalisation
☐ Fast (mode 0) ☐ Invert input
☐ No pixel correction ☐ Sharpen 0
☐ Flip horizontally ☐ Flip vertically
OK

Figure III: Change FSI control window

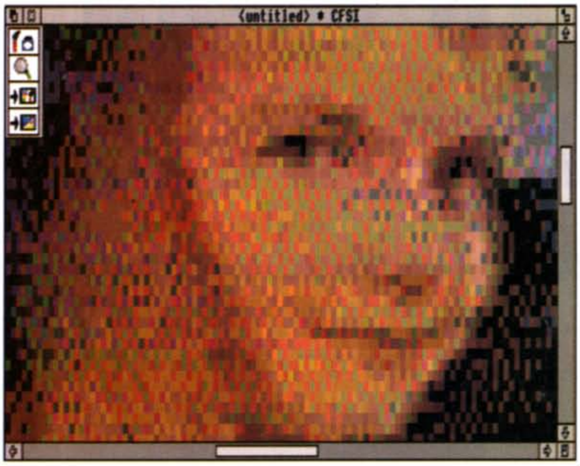


Figure V: Area of skin tones from Figure III enlarged to show dithering

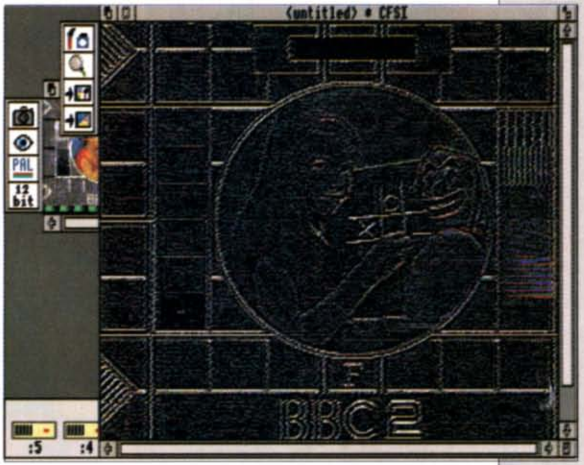


Figure VI: Figure III treated with level 8 sharpening

ChangeFSI as well as allowing you to save the window as a sprite and to save the grabbed 12bit data as a data file recognisable to !FastGrab.

ChangeFSI is a fascinating utility which is, for most people, rather complex to use. Figure III shows a window which eases its control.

ChangeFSI is capable of translating images from one mode to another, while preserving the greatest resolution and the closest colour match. It can alter aspect ratios, stretching and squeezing sprites.

Having grabbed an image, you open the ChangeFSI window and choose the output mode and X and Y size ratios. It took 2.5 minutes to change a 256 colour Mode 15 image to Mode 0 – shown in Figure IV – with nothing else active on the DeskTop.

All timings are on my old A440 without the new MEMC1a chip. Shading to produce colours not on the chosen palette is by dithering and is very successful (see Figure V).

When ChangeFSI converts images you can select how it controls the colours. The standard desktop palette will ensure that your sprite is compatible with Risc OS software, giving a grey monochrome image in modes of less than 16 colours.

If you need images for use in other software, you can choose the DigitalRGB palette, with 2 or 4 bit colour. No tints/16 greys will reduce the number of colours from 256 to the base 64, or in 16 colour modes will give a linear grey scale.

The image can be also enhanced in other ways. Dynamic range can be expanded and histogram equalisation applied. Both alter the colour intensity, and can help enhance a picture.

Sharpening is a digital treatment of the image and can be intense (8) giving edge detection shown in Figure VI or gentler (down to 31), just crisping up the picture. Sharpening an image in mode 21 to level 8 took 75 seconds.

Flipping the frame horizontally or vertically corrects misorientated images, while colours and intensities can be inverted to give a negative image.

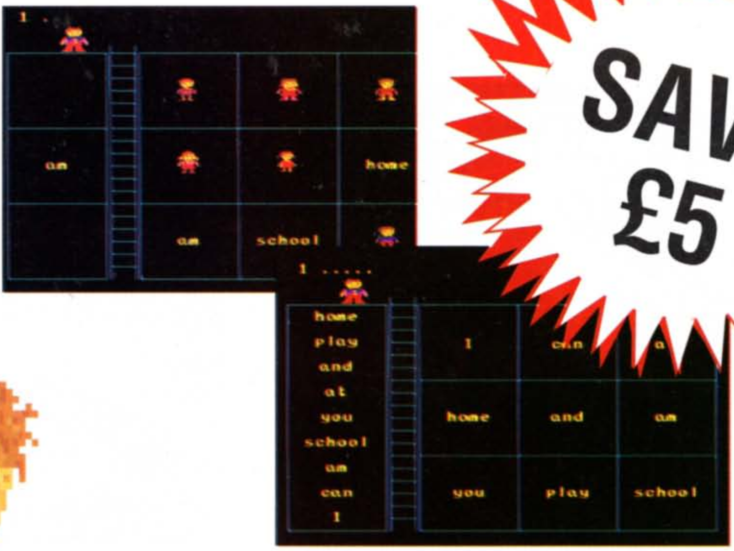
Image processing can be speeded up by displaying a Mode 0 blank screen, so freeing the Arc from screen updates. Using this option the earlier mode conversion above took 1.5 minutes, a 35 per cent saving.

The only negative point with the Hawk V9 is that in order to load the software there has to be a video signal present, otherwise the machine hangs up. I'm sure that Wild Vision will soon sort that one out.

Summing up

This digitiser has to be a very worthwhile purchase for someone wanting to import colour video information. It's very easy to use and the front end for the ChangeFSI routine is immensely useful.

PLAY AND READ


1
am
home
am
school
1 .....
home
play
and
at
you
school
am
can
I
I
can
a
home
and
am
you
play
school

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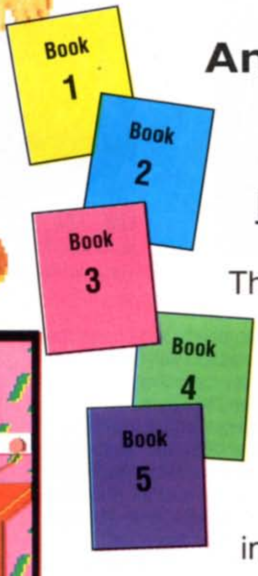
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Book 2
Book 3
Book 4
Book 5

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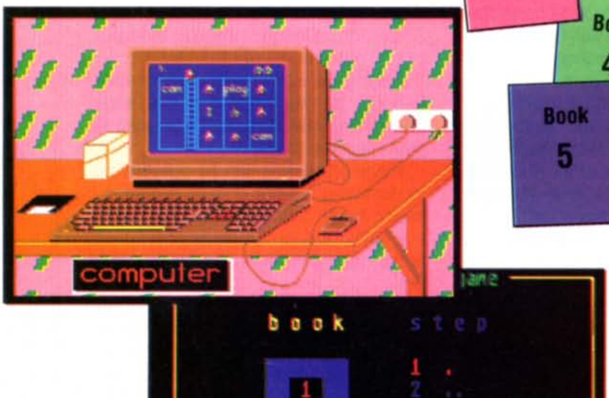
can
play
computer
book
step
1
1
2
3
4
5
speed: slow fast
use arrow buttons and spacebar

TO ORDER PLEASE USE ORDER FORM ON PAGE 119

Suss out the symbols

Trouble with your variables? Jon Harston shows how to list the little varmints

WHEN debugging a program you often want to know the names of all the variables that have been created. Not only does it give you a clue as to where an error may be, it also shows if you've accidentally invented a variable with a typing error. Well, VLIST will give you that useful list of variables.

Type in the listing and check it with Get it Right! And then save it using any name except VLIST. When run it generates the code for the routine which is saved by copying the command line printed at the end of the program.

You can issue the command by entering:

```
*VLIST
```

or, if you are using tape:

```
*RUN VLIST
```

The program won't work if you are using a 6502 second processor and gives the error *TUBE* if you are. Otherwise, all the currently defined variables will be listed.

Due to the way the variables are stored, they will be listed alphabetically by the first letter. Real variables are just listed by name, aligned into columns 10 characters wide. Integer variables will have their hexadecimal value displayed. Strings will be displayed as a string of characters with CHR$(&nn) for characaters less then 32 and greater than 126. Arrays of any kind are displayed showing the dimension sizes – as in the DIM command.

How it works

Variables are stored as linked lists – which means each block of data about a variable also contains a pointer to the start of the next block. There's one list for each letter of the alphabet, upper case and lower case.

Pointers to the start of the lists are stored in page 4, from &482 to &4F4, with a pointer to PROC names at &4F6 and a one to FNs at &4F8. PROC and FN names are stored the first time they are called, along with their address in memory.

The each block of data consists of the following:

Offset	Meaning
0 to 1	Address of next entry, or zero if at the end of the list.
2 to n	The variable name not including the initial first letter but including any *$*, *%* or (.
n+1	zero byte, end of name marker
n+2 to n+2+m	Data of the variable.

```
AA$="VLIST"
BLUE$=CHR$(&84)+CHR$(&9D)+CHR$(&85)
FILE$="(UnTitled)"
FD$="DATA"
HILIMIT   LOLIMIT   TIT$="DATA BASE"
T$=""
ZZ        datastart end       field$(&0014)
fsize(&0014)
fsflag    mult      pnt       p%=&00000000
recflag   rectot%=&00000000
start     PROC TITLE          PROC LINE
PROC OSC  FN YN
```

Sample output after using the VarList program

The program goes through a loop following all the lists of the variables until an end of list marker is found. As each variable entry is found, the name is printed out, preceded by the starting character, until a non-alphanumeric character is found. Depending on this final character, the program decides what data to print out.

Real variables just have their names and enough spaces printed to move to the next column of 10. This part also deals with printing the names of functions and procedures. For integer variables, first there's a check to see if this is an integer array. If not, the value is printed out in hexadecimal.

For arrays, the dimensions are printed out in hexadecimal. There wasn't enough room to squeeze in a decimal printout routine here and still fit the program in the CFS buffer, so hexadecimal was used instead.

For strings, there is first a check to see if it is an array. Otherwise, a loop goes through the string, sending each character to the *pr–char* routine which does some checking

➤

➤
to decide how to print out the character.

If the character is printable and the last one was also it is just output. Otherwise a plus sign and a quote are printed before the character itself.

If it's a control code or over 126 the routine prints *+CHR$(&nn)* where nn is the hexadecimal code of the character. In this case, if the previous character was a printable character, it first does a closing quote. In all, the string is displayed exactly as you could type it from Basic.

Get it right ✓

```
  10 =    0 0      590 = FD34 3
  20 =    0 0      600 = 6ACA E
  30 =    0 0      610 = 7D87 4
  40 = 412C C      620 = D8EA F
  50 = 38CF 0      630 = EA46 5
  60 = 20AC 6      640 = 5C85 9
  70 =   E2 B      650 = E6CE 0
  80 =    0 B      660 = 978B 2
  90 = 5E73 0      670 = 89AF 5
 100 = 6E9D 1      680 = EC6A B
 110 = AD2A 9      690 = B931 8
 120 = EA45 1      700 = 14A9 6
 130 =  325 9      710 = 6B54 8
 140 = 7F29 5      720 = 4C4F E
 150 = 8838 9      730 = A495 1
 160 = AEDE 1      740 = E8C0 4
 170 = 1CBA 1      750 = 7A5A 0
 180 = 17F4 3      760 = 9947 8
 190 = ECF6 4      770 = 6CA3 A
 200 = 7111 D      780 =  DE6 C
 210 = 6483 1      790 = 1F7B 1
 220 = 727E E      800 = 5FA3 E
 230 = 2A87 F      810 = 4F82 7
 240 = B8B7 E      820 = EE2F 3
 250 = 1F2C 7      830 = 3B13 8
 260 = CF06 4      840 = 307A 6
 270 = 9875 9      850 = D4DE F
 280 = 8A95 6      860 = 3A12 A
 290 = BFE4 8      870 = 7A41 2
 300 = A5C6 1      880 = 1C91 8
 310 = 2F01 9      890 = 78D2 C
 320 = 3C9F F      900 = 98CF F
 330 = 8892 9      910 = A488 5
 340 =  2F9 3      920 = 75B0 9
 350 = 1671 9      930 = 7B82 A
 360 = F75A 1      940 = EDA2 5
 370 = E9AC 3      950 = A1B0 3
 380 = 6575 6      960 = A94C C
 390 = D9B8 0      970 = 65A1 B
 400 = AD2D D      980 =  B21 4
 410 = 4BC6 B      990 = E426 8
 420 = 62C3 B     1000 = 3AB4 6
 430 = D9CF 7     1010 = F1AE 7
 440 = 6373 6     1020 = F78C 2
 450 = 9224 B     1030 = 19A9 F
 460 = BEE1 8     1040 = 851A 2
 470 = EC85 6     1050 = BE77 F
 480 = 3E00 C     1060 = D8F3 6
 490 =  603 F     1070 = 6201 C
 500 = C9EE D     1080 = BB2C 2
 510 = 3334 2     1090 = 3A9F 0
 520 = B909 B     1100 = E5D8 B
 530 = 1683 3     1110 = 14DD 5
 540 =  1F1 7     1120 = 1EB1 B
 550 = 90A9 C     1130 = DA42 3
 560 = 8DAB 1     1140 = 4EDF 6
 570 = A75E 3     1150 = FD2E 2
 580 = 8E07 6     1160 = FF51 2
```

All program listings in this issue can be downloaded FREE on...
MicroLink

```
   10 REM > VARLIST
   20 REM By Jon Harston
   30 REM (C) The Micro User
   40 oswrch=&FFEE:osnewl=&FFE7:mcode%=&
FFFF0900
   50 FOR pass%=0 TO 1
   60 P%=mcode%
   70 [OPT pass%*3
   80 \START
   90 BIT &27A:BPL vlist_start
  100 BRK:OPT FNs(CHR$254+"TUBE"):BRK
  110 .vlist_start
  120 LDX #0
  130 .loop
  140 LDA &482,X:STA &A8:INX
  150 LDA &482,X:STA &A9:INX:STX &AA
  160 JSR follow
  170 LDX &AA:CPX #116:BCC loop
  180 LDA &4F6:STA &A8
  190 LDA &4F7:STA &A9
  200 LDA #1:STA &AA:JSR follow
  210 LDA &4F8:STA &A8
  220 LDA &4F9:STA &A9:DEC &AA
  230 JSR follow:JMP osnewl
  240 .follow_exit:RTS
  250 .follow
  260 BIT &FF:BMI follow_exit
  270 LDA &A9:BEQ follow_exit
  280 LDY #2:LDA &AA:BEQ fn
  290 CMP #1:BNE follow1
  300 LDX #3:.proc_loop
  310 LDA proctab,X:JSR oswrch:DEX
  320 BPL proc_loop
  330 BMI follow_loop
  340 .fn:LDA #ASC"F":JSR oswrch
  350 LDA #ASC"N":JSR oswrch
  360 JMP follow_loop
  370 .follow1
  380 LSR A:CLC:ADC #ASC"@"
  390 JSR oswrch:LDY #2
  400 .follow_loop
  410 LDA (&A8),Y:CMP #ASC"0":BCC follow
2
  420 JSR oswrch:INY:BNE follow_loop
  430 .follow2
  440 CMP #0:BEQ real
  450 JSR oswrch
  460 CMP #ASC"%":BEQ integer
  470 CMP #ASC"$":BEQ string
  480 CMP #ASC"(":BEQ realarray
  490 BNE error
  500 .follow3
  510 JSR osnewl
  520 .follow4
  530 LDY #0:LDA (&A8),Y:TAX:INY:LDA (&A
8),Y:STA &A9:STX &A8
  540 JMP follow
  550 .string:JMP string_start
  560 .real
  570 DEY:LDA &AA:CMP #2:BCS real2
  580 ADC &AA:STY &AF:ADC &AF:TAY:INY:ST
Y &70
  590 .real2
  600 TYA:SEC:SBC #10:TAY:CPY #246:BCC r
eal2
  610 LDA #32:.real_loop
  620 JSR oswrch:INY:BNE real_loop:JMP f
ollow4
  630 .error:LDA #ASC"*":JSR oswrch:JMP
follow3
  640 .integer:INY:LDA (&A8),Y:CMP #ASC"
(":BEQ array
  650 LDA #ASC"=":JSR oswrch:LDA #ASC"&"
:JSR oswrch
  660 INY:INY:INY:INY:LDX #4
  670 .int_loop:LDA (&A8),Y:JSR pr_hex
  680 DEY:DEX:BNE int_loop:JMP follow3
  690 .array:JSR oswrch:.realarray:INY:I
NY
  700 LDA (&A8),Y:LSR A:INY:TAX:BNE arra
y_go
  710 .array_loop:LDA #ASC",":JSR oswrch
  720 .array_go:LDA #ASC"&":JSR oswrch
  730 LDA (&A8),Y:SEC:SBC #1:PHA:INY
  740 LDA (&A8),Y:SBC #0:JSR pr_hex
  750 PLA:JSR pr_hex:INY
  760 DEX:BNE array_loop
  770 LDA #ASC")":JSR oswrch:JMP follow3
  780 .string_start:INY:LDA (&A8),Y:CMP
#ASC"(":BEQ array
  790 LDA #ASC"=":JSR oswrch:LDA #0:STA
&AF
  800 INY:LDA (&A8),Y:STA &AB
  810 INY:LDA (&A8),Y:STA &AC
  820 INY:INY:LDA (&A8),Y:LDY #0:TAX:BEQ
 null_string
  830 LDA (&AB),Y:CMP #32:BCC string_loo
p
  840 CMP #127:BCS string_loop:LDA #34:J
SR oswrch
  850 .string_loop
  860 LDA (&AB),Y:PHA:JSR pr_char:PLA
  870 INY:DEX:BNE string_loop
  880 CMP #32:BCC string_exit:CMP #127:B
CS string_exit:BCC string_end2
  890 .null_string:LDA #34:JSR oswrch
  900 .string_end2:LDA #34:JSR oswrch
  910 .string_exit:JMP follow3
  920 .pr_char:CMP #127:BCS pr_check
  930 CMP #32:BCS pr_ok
  940 .pr_check
  950 PHA:TXA:PHA:CPY #0:BEQ pr_check2
  960 LDA &AF:BEQ pr_check1
  970 LDA #34:JSR oswrch:.pr_check1
  980 LDA #ASC"+":JSR oswrch:.pr_check2
  990 LDX #0:STX &AF:.pr_c_loop
 1000 LDA pr_table,X:JSR oswrch:INX:CPX
#6:BNE pr_c_loop
 1010 PLA:TAX:PLA:JSR pr_hex:LDA #ASC")"
:JMP oswrch
 1020 .pr_ok:CPY #0:BEQ pr_ok3
 1030 PHA:LDA &AF:BNE pr_ok2
 1040 LDA #ASC"+":JSR oswrch:LDA #34:JSR
 oswrch
 1050 .pr_ok2:PLA
 1060 .pr_ok3:STA &AF:JMP oswrch
 1070 .pr_table:OPT FNs("CHR$(&")
 1080 .pr_hex:PHA:LSR A:LSR A:LSR A
 1090 LSR A:JSR pr_hex2:PLA
 1100 .pr_hex2:AND #15:CMP #10:BCC over
 1110 ADC #6:.over:ADC #ASC"0":JMP oswrc
h
 1120 .proctab:OPT FNs("CORP")
 1130 ]:NEXT
 1140 PRINT"*SAVE VList ";~mcode%;" ";~P
%
 1150 END
 1160 DEFFNs(A$):$P%=A$:P%=P%+LENA$:=pas
s%*3
```

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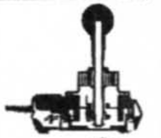

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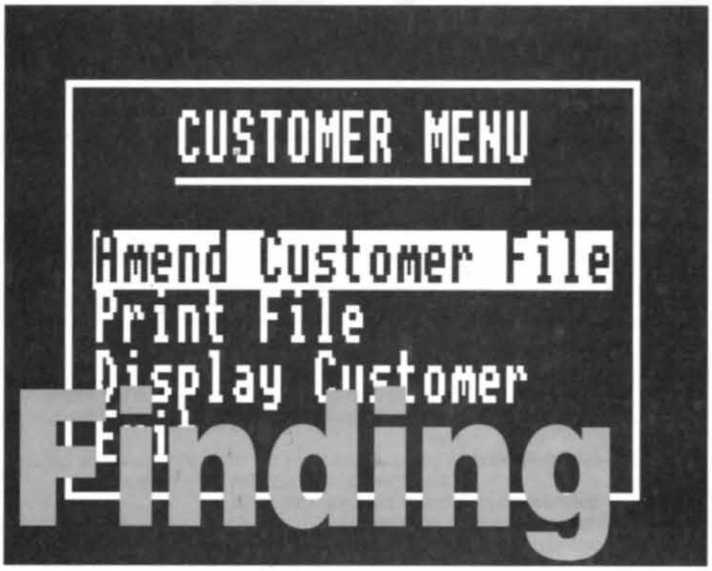

Finding applications

Glenn Marshall shows how you can put everything together to create the complete desktop system

LAST month we produced the level zero, or core, of our desktop. In this, the final article, we produce the overlay program, the applications themselves and also a useful pop-up menu routine.

The desktop overlay handler is very simple, all it does is load applications in and out of memory. The first time it is run it calls up the desktop screen and the pointer, then when a program has been selected, it loads the application's machine code and Basic program into memory.

When the new program has finished it should load the overlay program back and he process starts again.

Looking at Listing L-2-IV from last nonth, you can see that convieniently here are two labels *desktop* and *desk-op–loop*. This means we can call the forner on the first run and the latter from then nwards. This ensures that the complete creen is not re-drawn every time we read the overlay program.

The simplest way to recognise if the pro-am is on the first run is to use one of the sident variables, *A%* to *Z%* which are utomatically set to zero when the achine is turned on and also keep their ntents even when different programs are n.

Listing L-3-I contains the overlay pro-am. Notice that it turns the screen output with the command *FX3,6 as it loads an plication. This stops the desktop screen m being corrupted, so one of the first es of the new program has to be *FX3 to turn the screen back on again.

The following programs are needed to run the desktop and are on this month's subscription disc: DESK-MC, DESKTOP, CALC-BA, CALC-MC, CALE-BA and CALE-MC

When you have all the programs on disc turn the machine on – or set *A%* to zero – and type:

```
MODE3:PAGE=&2100:CHAIN "DESKTOP"
```

As we went into the level zero machine code routines in quite some detail, the two panels give a brief summary of those for the calculator and calendar – on the whole they just call the level zero code anyway.

The Basic programs are also easy to understand as they are broken down into simple procedures with all the variables having meaningful names.

Now let's look at pop-up menus. Although the desktop applications use Basic they do have to include special sections of assembler to interface with the main machine code routines. This can deter some users who like to program only in Basic. So let's produce a menu routine whose only interface to the routine is through the CALL command in Basic.

Only two calls are needed: The first sets the pointers that determine where the saved screen data goes. The second produces the menu by passing in the heading, options and screen position.

The routine automatically draws a box around the options then centres and underlines the menu heading. Figure I shows what they look like. The parameters for the call are:

- 1st colour for the box routine.
- 2nd colour for the box routine.
- 3rd colour for the box routine.
- 4th colour for the box routine.
- Horizontal location in character positions.

Vertical locations in character positions.
Menu heading.
Option strings.

For example, to produce a menu at text position 21,10 with the heading *MENU* and having three options which are Amend Data, Print Data and Exit use:

```
MODE 3
A$="MENU"
B$="Amend Data"
C$="Print Data"
D$="Exit"
CALL initialise menu
CALL menu down,?0,?255,?15,?240,?21,?11,
A$,B$,C$,D$
```

Of course you could put the strings directly into the CALL statement instead of storing them in strings. Notice that the vertical position is always the Y value plus one. Once a menu is drawn it will allow you to select an option by moving a bar over the options using the up and down cursor keys. The Return key will signify selection of the option that the bar is highlighting. The menu will then pull itself back up, with the number of the option selected held in memory location &7A.

Listing L-3-VI contains the full menu pro-

➤

➤
gram which uses many of the routines that we have looked at already. Run it then save the machine code with:

```
*SAVE "MENU" 1900 1D4D
```

Once you have done this you can load the machine code as part of your programs and have pop-up menus in them.

To test out the menu routine set PAGE to &1E00 and load the machine code into memory. Then load Listing L-3-VII and run it. This is an example program that shows how you can use the menu on different coloured or shaded backgrounds.

Notice that the program automatically works out the menu's background colour changes, the text and bar colour as appropriate.

● *Well that ends this series on a desktop environment for the 8 bit BBC Micro. With the help of this article and the example programs you should now be able to write applications. If you do why not send us a copy and we can put it on the monthly disc for everyone to include in their desktop?*

The calendar

To be able to produce a calendar, we need to know on which day of the week the first day of a month occurs. To do this, we assume a base date – 1/1/1900 which happens to be a Monday. We also assume that the days are numbered 0 to 6, where Sunday = 0, Monday = 1 and so on.

Now to work out the 1st of any other month in this year, we add up the number of days that have elapsed, assuming 365 days a year. Two other points must be taken into consideration – leap years and century leap years. A normal leap year occurs when the year number is exactly divisible by four. For example 1980 MOD 4 = 0, so it is a leap year, 1985 MOD 4 = 1,

Machine code routines

calendar	Draws the calendar.
input–box	Draws a box, which the year and month are entered in.
calendar–box	Draws the calendar box, using the dropped box routine.
calendar–icons–data	Sets the parameters for drawing the icons with the next routine.
display–calendar–icons	Draws four icons using the same principle as the calculator. It then draws another icon, but using the box routine.
calendar–days	Displays the days of the week.
erase–calender	What it says.
calendar–icon–positions	Sets up the values for the pointer–check routine. Notice we can't use *calendar–icon–data* because that is set to only draw four icons. We actually draw five icons, the four using the *display–icons* routine and another using the box routine. This means we have to inform the check routine that there are five icons to check, or it will only check the first four.
white–box	A routine to erase the calendar dates by drawing over them in the background colour.

The calculator

The Basic program is really centred around two strings – *store$* and *total$*. The idea is that as you type in numbers they are stored in *store$*. This continues until an operation key is pressed. When this happens the digits in *store$* are put into *total$* and evaluated. Then you type in the next number which goes into a blank *store$*. For example:

key	store$	total$	Notes
1	1		
2	12		
.	12.		
3	12.3		
+	12.3+	12.3	+ taken off and then evaluated
5	5	12.3	
=	5=	17.3	12.3 + 5, = sign taken off and then evaluated.

The process repeats and continues until you close the calculator.

Variables

store$	Latest number entered.
total$	Total in calculator.
memory$	The memory store.
on/off	Flag values.
decimal	Set if the number has a decimal point in it.
operation	Used for stopping the clear key working in certain circumstances.
digits	Number of digits allowed. This is used to allow an extra digit when a decimal point is used.
ypos,xpos	Position of the digits on the calculator display.
symbols$	Holds a list of operations that are allowed.
exit	Flag used to determine when the program ends.

Machine code routines

calculator	Main routine that calls the other routines to produce the calculator shape.
draw–calculator–shape	Using the *dropped–box* routine, it draws the outline of the calculator. Locations *stl,sth* are set here because the Basic calculator program will have been loaded in and so the area for saving data must be above this. Locations &2 and &3 give us TOP.
erase–calculator	What it says.
draw–calc–display	Draws the box that the calculator digits are displayed in.
calculator–icons–data	Sets up the icon positions and colours so that *pointer–check* and *display–icons* routine work correctly.
display–calc–keys	Produces the keys. Each is an icon that is a box with characters in it. The variables gpl & gph are used to work through the icon positions and gp2l & gp2h work through the text for each key. Each key is actually in a three byte format any keys that don't use three bytes have zero's stored in the data, which do nothing when sent through *oswrch*.

Procedures and functions

basic–variables	Set up global variables.
display (string$)	Displays the string passed in on the calculator display.
decode	Converts the icon values to characters.
number(key$)	Takes a number in *key$* and puts it into the *store$*.
do–operation(key$)	Carry out an evaluation of the string in *total$*.
c	Clears the number in *store$*.
percent	Produces percent calculations.
pi	Puts the PI value into *store$*.
put–decimal	Puts a decimal point into a number.
ac	Clears the *total$* and *store$*.
mc	Clear the memory.
mr	Recalls the value in memory to *store$*.
ms	Stores a number into memory.
inverse	Reverse the sign of a number.
error	Handles errors such as division by zero and escape.
assembler–variables	Sets the addresses of machine code routines into Basic variables.

so it's not. In a leap year February has 29 days instead of 28.

Century leap years are special occasions when a leap year is not actually a true leap year. This came about in 1752 ,when it was found that the calendar was wrong, and so they had to miss 10 days out of October – the 15th followed the 4th – to catch up, which also caused riots amongst the peasants who thought someone was stealing their time.

What this means is that every three out of four centuries are not leap years. So in 1700 A.D., 1800 A.D. and 1900 A.D. February had only 28 days while in 2000 A.D. it will have 29.

Monthly disc

All listings for this article are contained on this month's subscription disc. Aternatively they can be obtained by sending £2 and a formatted disc to Glen Marshall, 147 Warwick Road, Scunthorpe, South Humberside DN16 1HH.

Procedures and functions

add–month	Adds one to the month value.
add–year	Adds one to the year value.
sub–year	Subtracts one from the year value.
sub–month	Subtracts one from the month value.
check	Routine to check things such as the month going past December and so therefore setting it back to January and incrementing the year value.
enter–date	Allows the user to enter a year and month.
set–up–days	Sets the two arrays up for the days in a month and the running total.
set–up–months	Sets up an array of month names.
days–gone–by	Function to return the day of the week.
display(start%)	Prints the calender dates, starting on day *start%*.
calender–box	Calls a machine code routine to erase the dates.
global–variables	Declares the global variables used.
machine–variables	Sets the addresses of machine code routines into Basic variables.

Variables

year%	The year entered.
month%	The month entered.
icon%	The value of the icon that the pointer is clicked on.
total%(1,12)	Dimension zero is the number of days in each month while dimension one is the running total for each month.
month$(12)	The name of each month.
Badleap%	A flag that is set when a century is not a leap year.

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History of card Patience

IT is said that playing cards were introduced into Europe through Italy in the 14th century but it was not until around 1870 that the rules of any Patience games were written.

Before then, there must have been a vast number of local and family variations on the themes of some 150 games that are played today, and a few of them must have been reasonably established by 1816 when it was recorded that the exiled Napoleon played Patience.

From the end of the Crusades to the end of the Napoleonic Wars, the history of Patience is lost. Clearly many games must have existed, and some of their names suggest their approximate dates within the nineteenth century. There are, for example, Yukon, Klondike, Empress of India, and several variations on the name Napoleon.

It is supposed, however, that earlier games came to be named by association, so that Klondike was probably played, under a different name, long before the goldfields were worked, and Big Ben was invented as a name in 1950 to distinguish between two clock games.

Whichever way round it is, Card Patience of any variety works well on a micro and Canfield – which we feature here – is no exception.

Patience pays up

Michael Leete brings one of the world's oldest card games right up to date

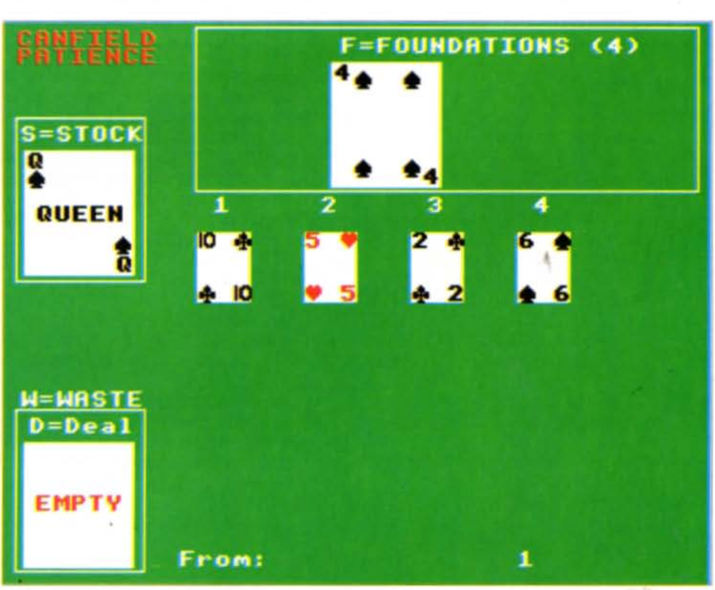
CANFIELD Patience was probably invented – or at least named and written down – in the Naughty Nineties at Saratoga, where a certain Mr. Canfield kept a casino. He introduced this particular form of patience as a gambling game, set the stakes and formalised the house rules.

The punter paid $50 to play and received five dollars for every card placed on the Foundation piles. If he completed the game, he was paid a bonus, making a total payment of 500 dollars. The attraction of the big win was enormous – a cavalry trooper's pay was $13 a month – but the odds were heavily in the House's favour.

The usual statistical estimate is that a full pack comes out once in 30 games and, for the rest, an average of about six Foundation cards is all that can be expected. Testing our computer version of the game gave rather better results.

Sixty three games came out in a total

➤



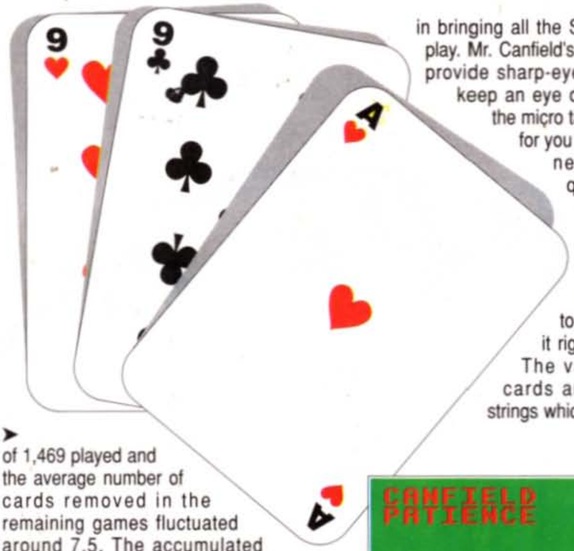
```
CANFIELD          F=FOUNDATIONS (4)
PATIENCE

S=STOCK

QUEEN             1     2     3     4

W=WASTE
D=Deal

EMPTY             From:             1
```



➤

of 1,469 played and the average number of cards removed in the remaining games fluctuated around 7.5. The accumulated fund then stood at a win of $11,310.

The method of play is simple: Thirteen cards are counted off the top of the pack and placed, face up, on the left of the table to form the Stock. The next card is the first Foundation and the object is to build four Foundation piles in suits, in ascending, circular order starting from the same value as the first card.

Four more are dealt, again face up, as the beginning of the Tableau. Cards from the remainder are dealt in threes and the top card of the resulting Waste may be placed on the Foundation or, alternately red and black, in the Tableau in descending, circular values. Part runs of cards may be moved from column to column and, as a column becomes vacant, it must first be filled from the Stock and then, at will, from the Waste.

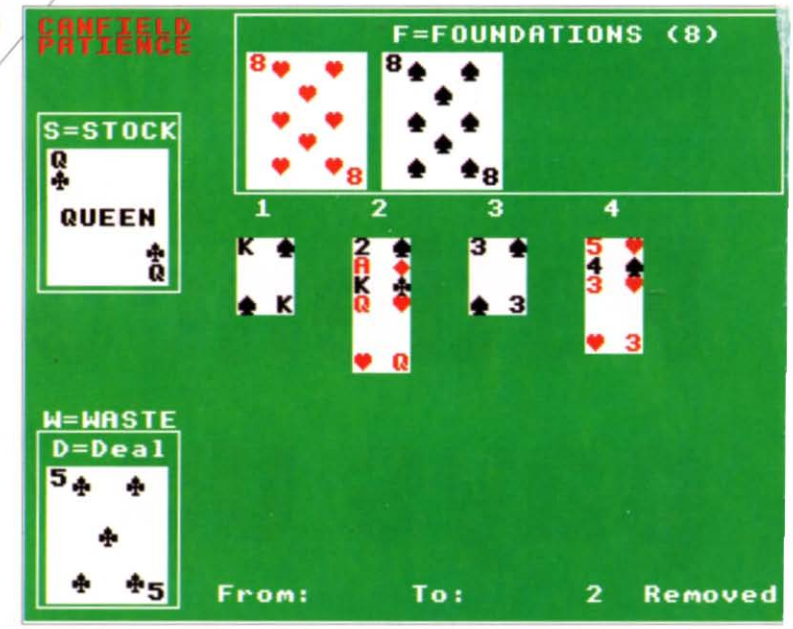
Cards cannot be transferred directly from the Stock to the Foundation – in other words, they must first go into a space. In essence, therefore, the chief difficulty lies in bringing all the Stock cards into play. Mr. Canfield's problem was to provide sharp-eyed croupiers to keep an eye out for cheats – the micro takes care of that for you and will set up a new game more quickly and more efficiently than Nick the Greek.

Type in the listing and use the checksums to ensure you get it right, then save it. The various sets of cards are handled as strings which, unfortunately, gobble up memory, so on a standard Model B, PAGE should be set to &1100 before running.

The listing has a number of unnecessary spaces and is wasteful of line numbers to make typing easier. Many consecutive instructions may be put into one program line once everything is running smoothly.

If the program has to be renumbered, note that in PROCn – which counts the number of spots on a card from the Data statements – a line number preceding the first statement is restored and successive statements are numbered consecutively.

● *Now you can try your hand at betting against Mr. Canfield and his remarkable game.*



```
   10 REM CANFIELD PATIENCE
         DO NOT RENUMBER THIS PROGRAM!
   20 REM by Michael Leete
   30 REM (c) The Micro User
   40 :
   50 IF PAGE<>&1100 THEN PAGE=&1100:CHA
IN"A.CFIELD"
   60 ON ERROR F%=F%+5*R:IF F%<50:CLS:CO
LOUR0:PRINTTAB(12,12)"You only have $";F
%:PRINTTAB(5,14)"Do you want to start ag
ain (Y/N)":GOTO 350 ELSE GOTO 90
   70 VDU23,224,54,127,127,127,62,28,8,0
,23,225,8,28,62,127,127,127,28,62,23,226
,0,8,28,62,127,62,28,8,23,227,8,28,28,10
7,127,107,8,28,23,228,0,255,255,255,255,
255,255,0,23,229,78,91,81,81,81,91,78,0
   80 DIMb$(4),s$(4),c%(4):F%=100
   90 MODE7:VDU23;8202;0;0;0;:R=0:P=14:P
RINT
  100 FORI%=1 TO 2:VDU132,157,135,141:PR
INTSPC5"CANFIELD";
  110 VDU140:IF I%=1 PRINTSPC3"by Michae
l Leete":NEXT
  120 PRINT''"KEYS"'"____"'"D=Deal (3 at
 a time)"SPC4"S=Stock"''"1-4=Tableau (Co
lumns)"SPC3"W=Waste-discards"'"F=Foundat
ions, ascending in value & suit"
  130 PRINT"ESCAPE=Restart"SPC6"Beep=Mov
e disallowed"'"Build tableau in alternat
e colours of"'"cards in decreasing value
s.  Vacant"'"spaces must be filled from
the Stock"'"until EMPTY. Then fill from
the Waste"'"at will."
  140 PRINT'"You start with $100 as your
 Stake."'
  150 PRINTCHR$(129)SPC(12)"Stake = $";F
%:PRINT'SPC13"Press SPACE";:A=GET:F%=F%-
50:k$="":pile$="":w$="A23456789"+CHR$229
+"JQK":v$="A23456789"+CHR$229+"JQKA23456
789"+CHR$229+"JQ"
  160 p$="2H2S2D2C3H3S3D3C4H4S4D4C5H5S5D
5C6H6S6D6C7H7S7D7C8H8S8D8C9H9S9D9C"+CHR$
229+"H"+CHR$229+"S"+CHR$229+"D"+CHR$229+
"CJHJSJDJCQHQSQDQCKHKSKDKCAHASADAC"
  170 MODE1
  180 A%=RND(-TIME)
  190 VDU23;8202;0;0;0;19,2,2;0;19,3,7;0
;
  200 REPEAT PROCi:VDU4:GCOL0,130:COLOUR
130:CLG
  210 PROCd:PROCs:PROCl
  220 REPEAT COLOUR3:PRINTTAB(10,30)"Fro
m:":*FX21
  230 REPEAT A$=GET$:UNTIL INSTR("1234SW
D",A$)<>0
  240 IF A$="D" PROCD:GOTO 320 ELSE PRIN
TTAB(16,30)A$:f%=VAL(A$):PRINTTAB(20,30)
"To:"TAB(29,30);R;TAB(32,30)"Removed":*F
X21
  250 REPEAT B$=GET$:UNTIL INSTR("1234F"
,B$)<>0
  260 PRINTTAB(24,30)B$:t%=VAL(B$)
  270 IF B$=A$ p%=0
  280 IF B$="F" PROCt:GOTO320
  290 IF A$="S" PROCpile:GOTO 320
  300 IF A$="W" A%=FNf:ELSE A%=FNm(f%,t%
)
  310 IF NOTA% PROCe
  320 PRINTTAB(16,30)SPC1TAB(24,30)SPC1
  330 UNTIL R=52:COLOUR1:PRINTTAB(9,30)"
Congratulations - You win $500":F%=F%+24
```

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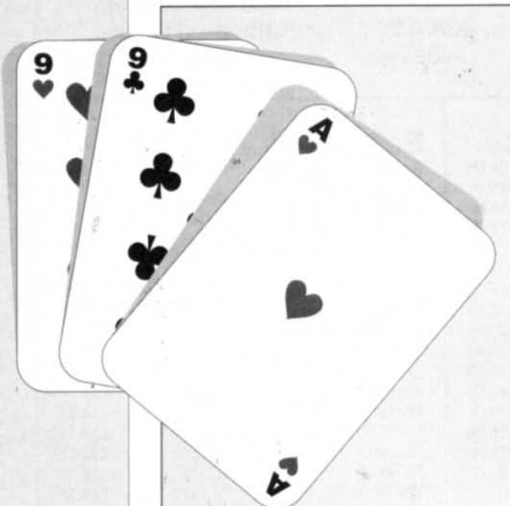

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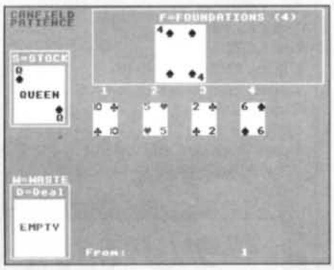
```
0
  340 FOR X=1 TO 10:SOUND1,-5-X,110+X,1:
SOUND1,-5-X,130+X,1:NEXT:*FX21
  350 REPEAT A=GET
  360 UNTIL A=78 OR A=89
  370 IF A=89 RUN:ELSE MODE7:END
  380 :
  390 DEFPROCpile
  400 IF P=0 PROCe:ENDPROC
  410 IF LEN(b$(t%))<>0 PROCe:ENDPROC
  420 c$=LEFT$(pile$,2):pile$=RIGHT$(pil
e$,LEN(pile$)-2)
  430 b$(t%)=c$:c%(t%)=1
  440 PROCQ:PROCf(t%)
  450 ENDPROC
  460 :
  470 DEFFNm(s%,d%)
  480 l$=RIGHT$(b$(d%),2):IFl$=""l$="0"
  490 n$=MID$(v$,INSTR(v$,LEFT$(l$,1))-1
,1)
  500 g$=b$(s%):FOR J%=1 TO LEN(b$(s%))S
TEP2
  510 x$=MID$(b$(s%),J%,1)
  520 IF x$=n$ THEN p%=J%
  530 NEXT
  540 IFp%<1THEN=0ELSEc$=MID$(b$(s%),p%,
2):IFINSTR(c$,n$)=0THEN=0ELSEIFNOTFNT TH
EN=0ELSEq$=MID$(g$,p%,LEN(g$)-p%+1)
  550 FOR X%=1 TO LEN(q$)STEP2:b$(d%)=b$
(d%)+MID$(q$,X%,2)
  560 b$(s%)=LEFT$(b$(s%),LEN(b$(s%))-2)
  570 PROCf(d%):PROCf(s%)
  580 NEXT
  590 c%(s%)=c%(s%)-1
  600 =TRUE
  610 :
  620 DEFFNf
  630 IF LEN(k$)<1 THEN=0ELSEc$=LEFT$(k$
,2):l$=RIGHT$(b$(t%),2)
  640 IFl$="" AND P>0 THEN =0 ELSE IF l$
=""l$="0":GOTO660
  650 n$=MID$(v$,INSTR(v$,LEFT$(l$,1))-1
,1):IFn$=""THEN=0ELSEIFINSTR(c$,n$)=0THE
N=0ELSEIFNOTFNT THEN=0
  660 b$(t%)=b$(t%)+c$
  670 PROCf(t%)
  680 k$=RIGHT$(k$,LEN(k$)-2)
  690 PROCS
  700 =TRUE
  710 :
  720 DEFFNT
  730 d$=RIGHT$(l$,1)
  740 e$=RIGHT$(c$,1)
  750 IF INSTR("SC",d$)<>0 AND INSTR("SC
",e$)<>0 THEN=0 ELSE IF INSTR("DH",d$)<>
0 AND INSTR("DH",e$)<>0 THEN=0 ELSE=TRUE
  760 :
  770 DEFPROCf(C%)
  780 y%=LEN(b$(C%))+20
  790 IF y%=20 VDU31,6*C%+5,y%/2+2:PRINT
SPC(3):VDU31,6*C%+5,y%/2+3:PRINTSPC3:VDU
31,6*C%+5,y%/2+4:PRINTSPC3:VDU31,6*C%+5,
y%/2+5:PRINTSPC3:ENDPROC:ELSE c$=RIGHT$(
b$(C%),2)
  800 IF INSTR("HD",RIGHT$(c$,1)) COLOUR
1 ELSE COLOUR0
  810 COLOUR131
  820 IF INSTR("H",RIGHT$(c$,1)) c$=LEFT
$(c$,1)+CHR$(224) ELSE IF INSTR("D",RIGH
T$(c$,1)) c$=LEFT$(c$,1)+CHR$(226) ELSE
IF INSTR("S",RIGHT$(c$,1)) c$=LEFT$(c$,1
)+CHR$(225) ELSE c$=LEFT$(c$,1)+CHR$(227
)
  830 c$=LEFT$(c$,1)+" "+RIGHT$(c$,1)
  840 VDU31,6*C%+5,y%/2+1:PRINT c$
  850 VDU31,6*C%+5,y%/2+2:PRINT SPC(3)
  860 VDU31,6*C%+5,y%/2+3:PRINT SPC(3)
  870 t$=LEFT$(c$,1):c$=c$+" "+t$:c$=RIG
HT$(c$,3)
  880 VDU31,6*C%+5,y%/2+4:PRINT c$
```



```
  890 PROCtck
  900 COLOUR130
  910 VDU31,6*C%+5,y%/2+5:PRINTSPC(3)
  920 ENDPROC
  930 :
  940 DEFPROCD
  950 IF(LEN(f$)=4 OR LEN(f$)=2) c$=LEFT
$(f$,2):k$=f$+k$:f$="":PROCS:ENDPROC
  960 FOR I%=1 TO 3:IF LEN(f$)=0 f$=k$:k
$=""
  970 k$=RIGHT$(f$,2)+k$:f$=LEFT$(f$,LEN
(f$)-2)
  980 NEXT
  990 c$=LEFT$(k$,2)
 1000 PROCS
 1010 ENDPROC
 1020 :
 1030 DEFPROCs
 1040 f$="":D%=52
 1050 FOR I%=1 TO 52
 1060 A%=INT(RND(1)*D%+1)
 1070 f$=f$+MID$(p$,2*A%-1,2)
 1080 L$=LEFT$(p$,(A%-1)*2):R$=RIGHT$(p$
,(LEN(p$)/2-A%)*2)
 1090 p$=L$+R$
 1100 D%=D%-1
 1110 NEXT:p$=f$:ENDPROC
 1120 :
 1130 DEFPROCl
 1140 COLOUR3:PRINTTAB(19,1)"F=FOUNDATIO
NS"TAB(1,6)"S=STOCK"
 1150 VDU5:MOVE380,700:GCOL0,3:PRINT"1
   2     3     4"
 1160 VDU4,31,1,21:PRINT"W=WASTE"SPC30:P
ROCS
 1170 FOR I%=13 TO 1 STEP-1
 1180 pile$=RIGHT$(f$,2)+pile$
 1190 f$=LEFT$(f$,LEN(f$)-2)
 1200 NEXT
 1210 c$=RIGHT$(pile$,2)
 1220 PROCQ
 1230 c$=RIGHT$(f$,2)
 1240 f$=LEFT$(f$,LEN(f$)-2)
 1250 x$=LEFT$(c$,1)
 1260 PRINTTAB(33,1)"("+x$+")"
 1270 S%=INSTR("HSDC",RIGHT$(c$,1))
 1280 s$(S%)=c$
 1290 PROCR(S%)
 1300 J%=INSTR(w$,LEFT$(c$,1))
 1310 x$=MID$(v$,J%,13):v$="#"+x$+"0"
 1320 FOR I%=1 TO 4
 1330 b$(I%)=RIGHT$(f$,2)
 1340 f$=LEFT$(f$,LEN(f$)-2)
 1350 PROCf(I%)
 1360 c%(I%)=1
 1370 NEXT
 1380 ENDPROC
 1390 :
 1400 DEFPROCQ
 1410 P=P-1:IF P=0 c$="#"
 1420 PROCp(LEFT$(pile$,2),44,560)
 1430 ENDPROC
 1440 :
 1450 DEFPROCS
 1460 PROCp(LEFT$(k$,2),44,32)
 1470 ENDPROC
 1480 :
 1490 DEFPROCi
 1500 FOR I%=1 TO 4
 1510 b$(I%)=STRING$(24," ")
 1520 s$(I%)="#"
 1530 c%(I%)=1
 1540 NEXT
 1550 ENDPROC
 1560 :
 1570 DEFPROCp(c$,x%,y%)
 1580 IF c$="#" c$=""
 1590 VDU29,x%;y%;24,-4;0;192;227;
 1600 GCOL0,131:CLG:VDU5
 1610 IF c$="" GCOL0,1:MOVE16,128:PRINT"
EMPTY":VDU4:ENDPROC:ELSE V$=LEFT$(c$,1):
v%=INSTR(w$,V$):S$=CHR$(223+INSTR("HSDC"
,RIGHT$(c$,1))):IFINSTR("HD",RIGHT$(c$,1
)) GCOL0,1 ELSE GCOL0,0
 1620 MOVE0,223:PRINT V$
 1630 MOVE160,32:PRINT V$
 1640 IF v%>10 PROCP:ELSE PROCn
 1650 VDU4:PROCtck
 1660 ENDPROC
 1670 :
 1680 DEFPROCn
 1690 RESTORE v%+2500
 1700 REPEAT READx%,y%
 1710 IF x%<>0 MOVEx%*4-16,y%*4+16:PRINT
S$
 1720 UNTIL x%=0
 1730 ENDPROC
 1740 :
 1750 DEFPROCP
```

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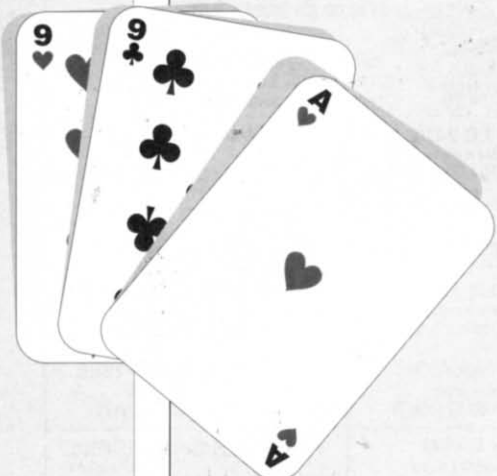

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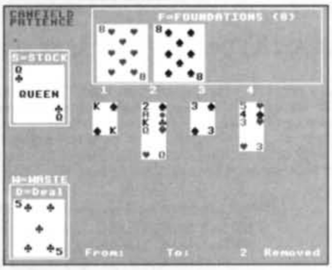
```
 1760 IF V$="J" V$="JACK":MOVE32,124:PRI
NT V$:ELSE IF V$="Q" V$="QUEEN":MOVE16,1
24:PRINT V$:ELSE V$="KING":MOVE32,124:PR
INT V$
 1770 MOVE0,190:PRINTS$:MOVE158,68:PRINT
S$:ENDPROC
 1780 :
 1790 DEFPROCR(S%)
 1800 R=R+1
 1810 PRINTTAB(29,30);R
 1820 PROCp(c$,S%*224+148,720)
 1830 ENDPROC
 1840 :
 1850 DEFPROCt
 1860 IF A$="W" c$=LEFT$(k$,2) ELSE c$=R
IGHT$(b$(f%),2)
 1870 IFc$=""PROCe:ENDPROC
 1880 S%=INSTR("HSDC",RIGHT$(c$,1)):n$=M
ID$(v$,INSTR(v$,LEFT$(c$,1))-1,1)
 1890 IF LEFT$(s$(S%),1)<>n$ PROCe:ENDPR
OC:ELSE s$(S%)=c$:PROCR(S%):IF A$="W" k$
=RIGHT$(k$,LEN(k$)-2):PROCS:ENDPROC:ELSE
 c$=b$(f%):b$(f%)=LEFT$(c$,LEN(c$)-2):IF
 LEN(c$)/2-1<c%(f%)c%(f%)=c%(f%)-1
 1900 PROCf(f%)
 1910 ENDPROC
 1920 :
 1930 DEFPROCd
 1940 GCOL0,3:MOVE0,0:DRAW0,1023:DRAW127
9,1023:DRAW1279,0:DRAW0,0:MOVE24,24:DRAW
24,318:DRAW256,318:DRAW256,24:DRAW24,24
 1950 MOVE348,714:DRAW348,1008:DRAW1255,
1008:DRAW1255,714:DRAW348,714:VDU5:MOVE5
0,302:PRINT"D=Deal"
 1960 MOVE24,550:DRAW24,844:DRAW256,844:
DRAW256,550:DRAW24,550:GCOL0,1:MOVE24,10
00:PRINT"CANFIELD":MOVE24,970:PRINT"PATI
ENCE":VDU4
 1970 ENDPROC
 1980 :
 1990 DEFPROCe
 2000 SOUND1,-7,9,3
 2010 COLOUR1:PRINTTAB(10,28)"Disallowed
"
 2020 n=TIME:REPEAT UNTILTIME>n+100
 2030 COLOUR130:PRINTTAB(10,28)SPC(10)
 2040 ENDPROC
 2050 :
 2060 DEFPROCtck
 2070 SOUND0,-5,5,1
 2080 FOR C=1 TO 200:NEXT
 2090 ENDPROC
 2100 :
 2500 REM: Data for Cards
 2501 DATA24,27,0
 2502 DATA24,48,24,8,0
 2503 DATA24,48,24,27,24,8,0
 2504 DATA13,48,35,48,13,8,35,8,0
 2505 DATA13,48,35,48,13,8,35,8,24,27,0
 2506 DATA13,48,35,48,13,8,35,8,13,27,35
,27,0
 2507 DATA13,48,35,48,13,8,35,8,13,27,35
,27,24,38,0
 2508 DATA13,48,35,48,13,8,35,8,13,27,35
,27,24,38,24,18,0
 2509 DATA13,48,35,48,13,8,35,8,24,27,13
,35,35,35,13,21,35,21,0
 2510 DATA13,48,35,48,13,8,35,8,13,35,35
,35,13,21,35,21,24,38,24,18,0,0
```



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```
  10 =    0 0
  20 =    0 0
  30 =    0 0
  40 = 9719 9
  50 = EAB6 3
  60 = 5627 9
  70 = 440B A
  80 = ABDB 3
  90 = 2050 E
 100 = E2A9 0
 110 = E78E A
 120 = 6ED0 2
 130 = D15D 4
 140 = 9FAA 8
 150 = A924 A
 160 = C07A E
 170 = EA3A F
 180 = EFFA 6
 190 = DCFF 2
 200 = E78E 7
 210 = 61E8 5
 220 = 7AC1 0
 230 =  245 B
 240 =  87E E
 250 = C2FB 7
 260 = B977 A
 270 =  802 D
 280 = 2CF5 2
 290 = BB24 F
 300 = 3F3C 6
 310 = CC48 1

 320 = 4958 F
 330 = FB94 0
 340 = 8127 0
 350 = 9754 1
 360 = 5552 E
 370 = 4B7C F
 380 = 9719 9
 390 = A4E9 2
 400 = 4E11 C
 410 = 81B8 B
 420 = 731F 5
 430 = A1D8 7
 440 = C0C2 4
 450 = ED0F E
 460 = 9719 9
 470 = FBB5 6
 480 =  649 F
 490 = 3245 3
 500 = BBD8 7
 510 = 3DFD 3
 520 = A209 0
 530 = 2C83 3
 540 = D33E D
 550 = 522A E
 560 = C4ED 0
 570 = E1D8 A
 580 = 2C83 3
 590 = 217E 5
 600 = 453B 3
 610 = 9719 2
 620 = FA1F 3

 630 =  7B5 D
 640 = 9C44 D
 650 = 7784 0
 660 = 5CB9 D
 670 = 34B8 5
 680 = 49FA C
 690 = 1F35 3
 700 = 453B B
 710 = 9719 D
 720 = EC0E F
 730 = 8938 9
 740 =  7E2 5
 750 = B6D4 E
 760 = 9719 A
 770 = DFE9 5
 780 = 307C 2
 790 = 7126 0
 800 = AB13 A
 810 =  573 E
 820 = A391 3
 830 = 6A91 9
 840 = A273 3
 850 = 8130 D
 860 = C6E3 9
 870 = AECD 6
 880 = E172 B
 890 = F559 C
 900 = 1552 E
 910 = FC9C 6
 920 = ED0F 8
 930 = 9719 3
 940 = 5A26 D

 950 = B5D1 E
 960 = A792 E
 970 = 47B7 4
 980 = 2C83 1
 990 = 8154 E
1000 = 1F35 F
1010 = ED0F 7
1020 = 9719 F
1030 = 1C92 F
1040 =  AE7 F
1050 = 479B 1
1060 = 5F0A A
1070 = D779 D
1080 = 3451 8
1090 = 6303 A
1100 = D824 F
1110 = 7744 1
1120 = 9719 C
1130 = FF4C 4
1140 = E7C3 F
1150 = 26B3 3
1160 = 3BC6 6
1170 = 5C29 2
1180 = BD2F 1
1190 = 38D8 4
1200 = 2C83 3
1210 = D0E0 4
1220 = 3F77 7
1230 = 2B6E 3
1240 = 38D8 C
1250 = 816F A
1260 = A4A1 6

1270 =  6ED 7
1280 = E304 F
1290 = B206 F
1300 = 6A10 7
1310 = 8E7B 5
1320 = D6C9 0
1330 = B9B1 D
1340 = 38D8 A
1350 = B34C 4
1360 = 1525 5
1370 = 2C83 6
1380 = ED0F 3
1390 = 9719 9
1400 = 18B2 5
1410 = 20CC B
1420 = 7FD7 7
1430 = ED0F 0
1440 = 9719 D
1450 = 38F0 6
1460 = FB9D 5
1470 = ED0F 4
1480 = 9719 F
1490 = AFE9 2
1500 = D6C9 3
1510 = F288 2
1520 = BA52 F
1530 = 1525 1
1540 = 2C83 D
1550 = ED0F 2
1560 = 9719 F
1570 = DE06 1
1580 = D4F8 2

1590 = E25B 5
1600 = 2D5C 3
1610 = FD74 F
1620 = DF43 8
1630 = A889 D
1640 = A13D 1
1650 =  43E 8
1660 = ED0F D
1670 = 9719 8
1680 = DF0E 1
1690 = B5BE 0
1700 = 9598 E
1710 = FE02 3
1720 = 3851 5
1730 = ED0F F
1740 = 9719 1
1750 =  893 8
1760 = B11F D
1770 = 1AC1 8
1780 = 9719 0
1790 = 1962 0
1800 = 881E C
1810 = F450 E
1820 = 8E52 D
1830 = ED0F 4
1840 = 9719 0
1850 = 6C75 6
1860 = D7F4 1
1870 = 56AA 5
1880 = C62E 0
1890 = 3BD2 A
1900 = 19BB 6

1910 = ED0F 5
1920 = 9719 7
1930 = 7E44 C
1940 = 1B8B 2
1950 = 302D 5
1960 = 3007 7
1970 = ED0F B
1980 = 9719 E
1990 = 6E65 B
2000 = 646A F
2010 = ACD5 A
2020 = B5A0 A
2030 = 7A8F 1
2040 = ED0F 4
2050 = 9719 1
2060 = E3C1 8
2070 = 3219 F
2080 = 2DF6 E
2090 = ED0F 4
2100 = 9719 3
2500 =    0 3
2501 = 40E2 5
2502 = 94A8 4
2503 = C15B 0
2504 = DAF3 D
2505 = CD0F D
2506 = 9198 2
2507 = CB1B D
2508 = 1CE7 1
2509 = E64B D
2510 = 4C41 F
```

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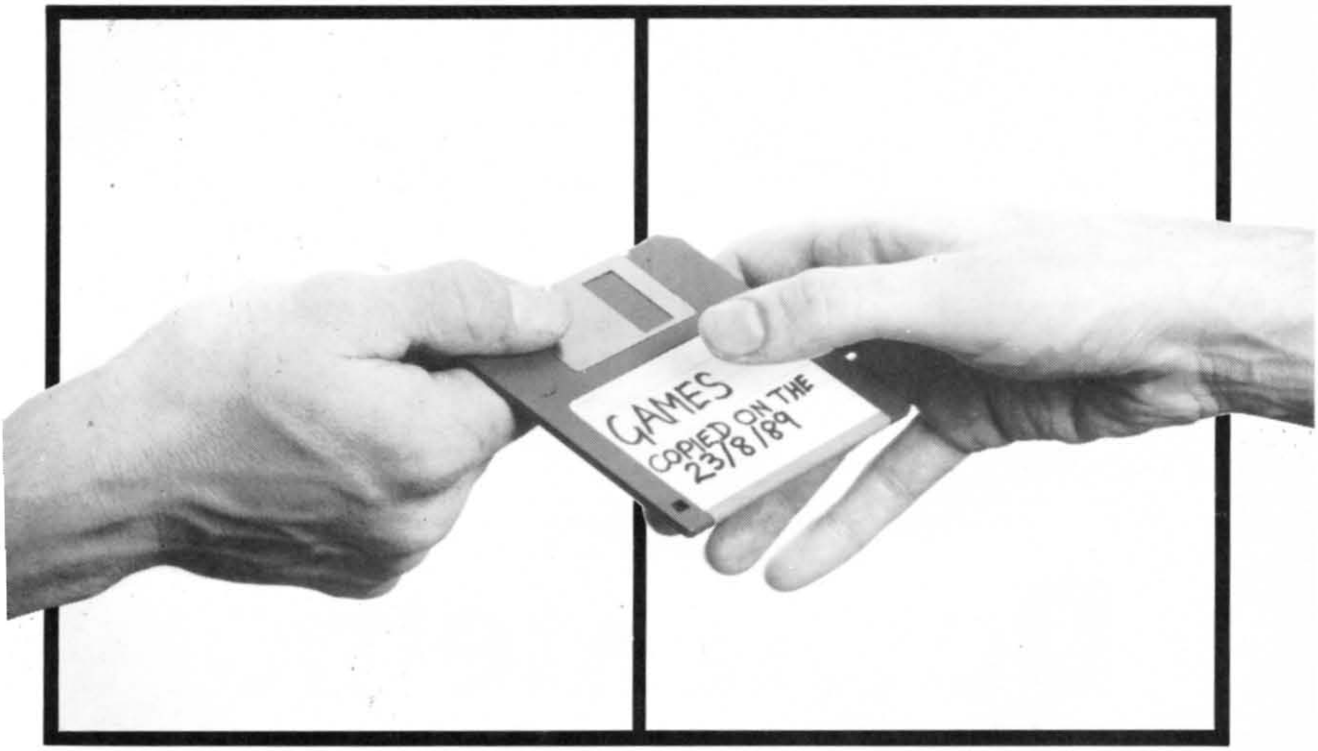

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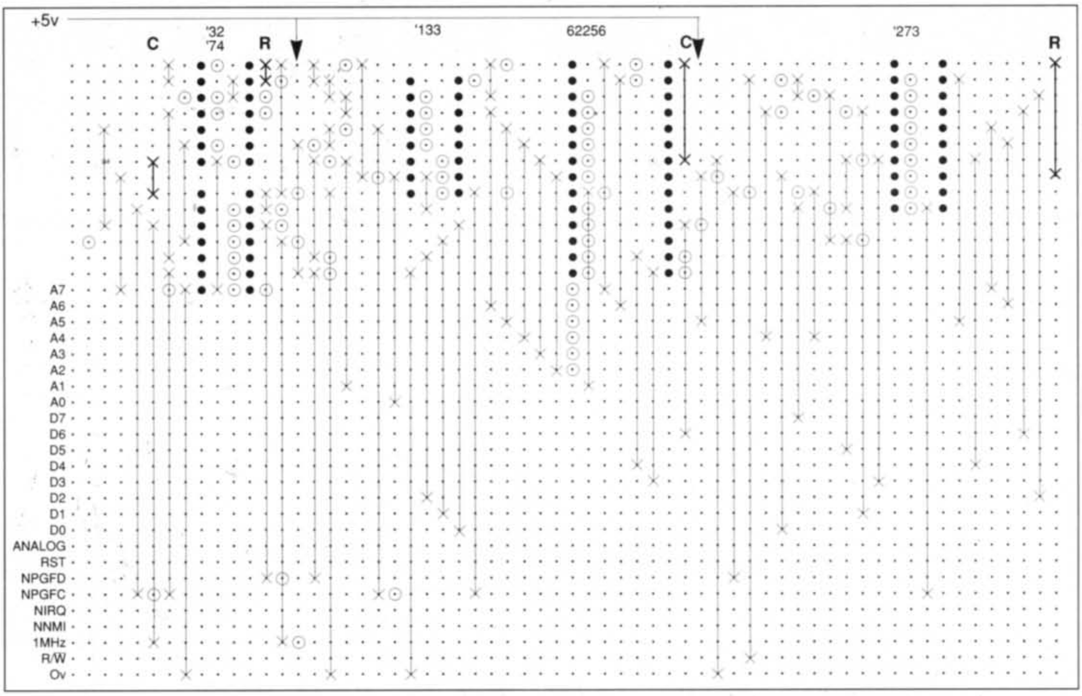

Figure I: The main board: The copper tracks of the veroboard run horizontally, face down. Circles represent cuts in the copper tracks! You can use a hand drill to enlarge the holes until the track is broken. Lines and crosses show where copper tracks should be joined.

Down memory

Rob Anderson offers a way of giving your BBC Micro a useful boost

THE BBC Micro's long history has been full of add-ons – including numerous memory expansion boards to help you squeeze every last ounce of usefulness out of your machine.

Most existing ram boards fall into one of two categories – either shadow ram to tuck the screen out of the way or sideways ram to take extra rom images or an expanded printer buffer.

But a neglected area of expansion is available via the 1MHz bus which lives between the Tube and user port under the keyboard. Using this we could add megabytes of memory – but for the sake of simplicity and cost we'll just have another 32k.

Unfortunately existing software won't be able to use this extra ram so next month we'll be supplying some special software to provide the basic tools necessary for you to create a ram disc to store programs and screens.

However, this simple application is really only the tip of the iceberg. With the general interfacing principles shown here it's possible to build a multitude of add-ons which provide more facilities and faster access than would otherwise be available via the user port – one possibility is a 16 bit digital to analogue converter.

The 1MHz bus comprises a 34 pin connector which provides direct access to the 6502's data bus and the lower 8 bits of the address bus. These can be used by accessing a reserved area of the BBC Micro's memory map – called Jim – which occupies page &FD. When Jim is written to, a special control line called NPGFD – Not PaGe FD – goes low which can be used to detect accesses.

So the command:

```
?&FD01=&21
```

would place &21 on the data bus, &01 on the low eight bits of the address bus and NPGFD would pulse low. In addition, a line called R/W* – read/not write – specifies whether we are reading or writing to Jim. Therefore we can perform input and output to any one of 256 locations.

This is fine but 256 locations is not enough for a worthwhile memory board. So we can take advantage of another line on the bus called NPGFC – Not PaGe FC – which pulses low whenever page &FC – called Fred – is accessed. This works in the same way as Jim but most of the page is reserved by Acorn for other uses and we are only allowed to touch &FCC0 to &FCFF. This is no problem because we can use &FCFF as a paging register to enable the high byte of an address to be latched into our memory board – in fact &FCFF is reserved for this very purpose.

So using &FCFF we can specify 256 pages and the accesses to Jim give 256 locations providing us with a total of 64k of address space – although the circuit in Figure I only implements 32k.

How it works

As an example let's say we want to write the value &23 to location &ABCD on the ram board. To set the correct page type in Basic.

```
?&FCFF=&AB
```

Then key:

```
?&FDCD=&23
```

This selects position &CD within page &AB

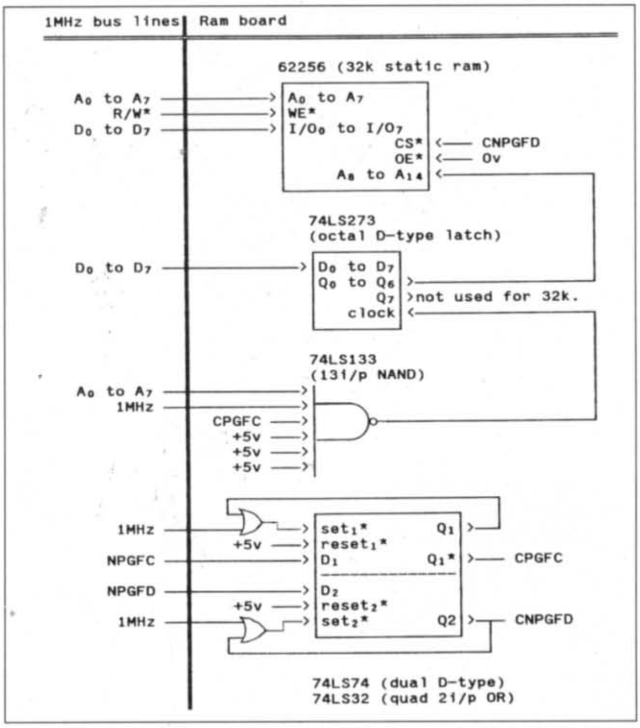
1MHz bus lines
Ram board
62256 (32k static ram)
A0 to A7
R/W*
D0 to D7
A0 to A7
WE*
I/O0 to I/O7
CS*
OE*
A8 to A14
CNPGFD
0v
74LS273
(octal D-type latch)
D0 to D7
D0 to D7
Q0 to Q6
Q7
>not used for 32k.
clock
74LS133
(13i/p NAND)
A0 to A7
1MHz
CPGFC
+5v
+5v
+5v
1MHz
+5v
NPGFC
NPGFD
+5v
1MHz
set1*
reset1*
D1
Q1
Q1*
CPGFC
D2
reset2*
set2*
Q2
CNPGFD
74LS74 (dual D-type)
74LS32 (quad 2i/p OR)

Figure II: Schematic of 32k ram board

32k parts list

Quantity	Item
2	1k ohm quarter watt resistors.
2	1uF 16v miniature disc ceramic capacitors.
1	Vero board – 39*62 holes.
1	34 way ribbon cable – maximum length 60cm.
1	34 way IDC female socket for connection to BBC 1MHz bus.
1	20 pin DIL socket
1	74LS273
1	28 pin DIL socket
1	62256 static ram
1	16 pin DIL socket
1	74LS133
2	14 pin DIL socket
1	74LS32
1	74LS74
1	BBC Micro power supply unit plug with 2 pins.
Some	Connection wire, solder and so on.

All these parts can be obtained from any good electronics shop or by mail order.

lane

and places &23 there. To print the contents of location &1234 you can use:

```
?&FCFF=&12:PRINT ?&FD34
```

Figure II shows how this is idea implemented in the hardware. The high address is latched using an octal D-type latch, which stores the 6502's data lines when (A0 to A7 are 1) AND (Fred is being accessed). A 13-input NAND performs the logic for this – note the 1MHz signal is also fed in for added timing stability.

Another important point is NPGFC and NPGFD are not used directly but fed through D-types which are configured to produce glitch-free signals called CPGFC – Clean PaGe FC – and *CNPGFD* – Clean Not PaGe FD.

This clean up circuit is extremely important and should always be used with applications running from the 1MHz bus.

The low eight address bits are presented to the ram chip directly from the 6502's address bus along with the eight data lines. R/W* is connected directly to WE* to select read or write from the ram chip, which has its output constantly enabled by putting OE* to 0v. Finally, Not Chip Select – CS* – is connected to CNPGFD so a read or write cycle only takes place when Jim is accessed.

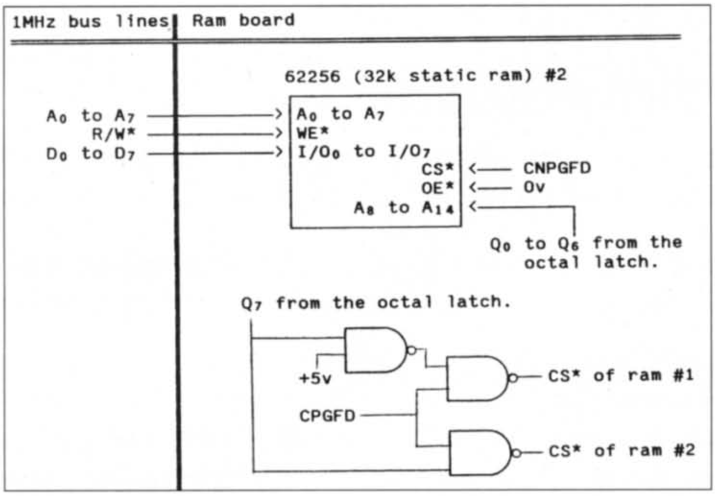
1MHz bus lines
Ram board
62256 (32k static ram) #2
A0 to A7
R/W*
D0 to D7
A0 to A7
WE*
I/O0 to I/O7
CS*
OE*
A8 to A14
CNPGFD
0v
Q0 to Q6 from the octal latch.
Q7 from the octal latch.
+5v
CPGFD
CS* of ram #1
CS* of ram #2

Figure III: 64k ram board additions

How to make it

Figure I shows the layout. Links between tracks can be made using bare connection wire providing due care is made to ensure the wires are taut enough to prevent them touching any other wires. The order of construction should be:

- Cut all tracks in the places represented by circles in Figure I.
- Add connection wires which lie under any chips.
- Add the chip holders.
- Add the remaining wires.
- Add the +5v wires, capacitors and resistors.
- Solder the ribbon cable to the board using Figure IV for guidance. All 0v lines should be connected together.
- Triple check your construction.
- Check the +5v line is not shorting with

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any of the 0v lines – use the resistance measurement of a multimeter to check it.

- Plug in the chips.

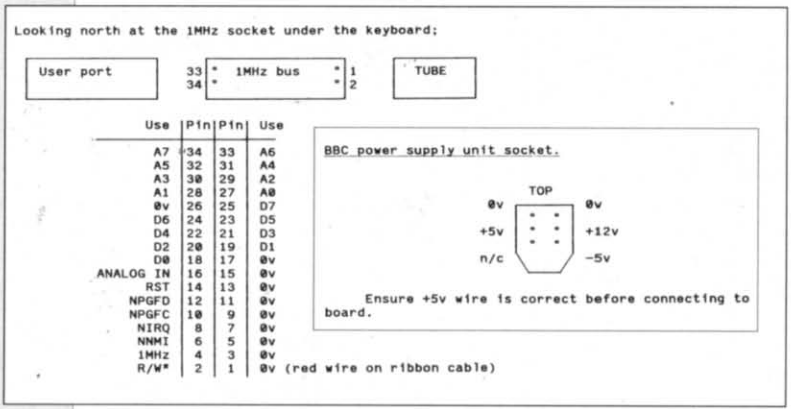
The ram board requires very little power and any stable +5v supply may be used. An ideal source is the BBC Micro power supply unit socket see Figure IV.

Having got this far, plug the ram board in and switch on. If the micro does not power up as normal, switch off immediately and check all connections again.

Now type in and run the program RamTest – with any second processor turned off – to ensure all the data lines are correct. This works by sending a pseudo-random binary sequence to the board which, although not a full test will show up fundamental faults such as incorrect data line connections.

Five pages of memory are written to and then read back and the values that have been sent and received are displayed in binary to enable data line errors to be identified easily.

- *Next month we'll look at some comprehensive Basic and assembler routines to enable a more thorough test to be made and to provide a base on which applications can be written. We'll also take a look at a rom image that will implement a simple ram disc. Until then happy soldering.*


Looking north at the 1MHz socket under the keyboard;

Use	Pin	Pin	Use
A7	34	33	A6
A5	32	31	A4
A3	30	29	A2
A1	28	27	A0
0v	26	25	D7
D6	24	23	D5
D4	22	21	D3
D2	20	19	D1
D0	18	17	0v
ANALOG IN	16	15	0v
RST	14	13	0v
NPGFD	12	11	0v
NPGFC	10	9	0v
NIRQ	8	7	0v
NNMI	6	5	0v
1MHz	4	3	0v
R/W*	2	1	0v (red wire on ribbon cable)

BBC power supply unit socket.

Ensure +5v wire is correct before connecting to board.

Figure IV: 32k ram board connections

Up to 64k

It is quite possible to make a 64k version of the ram board and Figure IV gives the necessary modifications to the 32k version.

The main addition to the circuit is another 32k ram chip along with some decode circuitry to determine which block of 32k is to be accessed. This is performed using three NAND gates which will only let the select signal CPGFD through to one of the chips as directed by the most significant bit of the high address byte – Q7, which was not required in the 32k version.

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Mike Cook explores the use of keyboard extensions and takes the fear out of soldering

Some time ago Jason Smith wrote to my problem page asking how to connect external keys to a micro. I answered that the simplest way was to wire them up across the switch. However, Jason, subsequently wrote to say that he wouldn't have a clue where to start. So this month for Jason and all the others who are new to interfacing, I thought I would give several clues of how – and where – to begin.

For tools you'll need a pair of thin, long-nose pliers with a tip not much greater than 2mm, a small pair of side cutters and finally you might need a pair of wire strippers to remove insulation. When I was young I used to use my teeth for this and had a nice sharp notch on the side of my left eye tooth.

Nowadays – while I still use my original set of teeth – they are not as firmly attached as they used to be and I have acquired a fine collection of wire strippers. Nevertheless, for very fine insulated wire nothing beats the feel and control you get with teeth.

One of the tricks in interfacing is to know which end of the soldering iron is hot and try to remember not to catch it if you drop it. My early scars have now healed. You need a good soldering iron – they can cost more than £40. I use a Weller low-voltage model with a magnetically temperature-controlled, iron-plated bit. It is generally known in the trade to be one of the best available. However, for just a small amount of soldering a lower cost one will do.

The important thing to remember is to get an iron with enough power. The 15 watt ones are a waste of time, they generally have a tiny tip and will not get anything but the smallest joint hot. As a rule I would go for at least a 25 watt iron, but you have to be careful, as, if the bit is too small it will burn out quickly. On the other hand, you don't want it to be too large as you will not be able to cope with small joints.

So really you need some sort of temperature control on the iron so that it has the power to deal with large joints but will not overheat when not being used. If your iron doesn't have any form of control you will have to switch it off when not in use.

Having got the iron warmed up you need to prepare it for a joint. The first job is to clean it, some modern irons have plated tips and do not take kindly to being rubbed with a file. What you need to do is to clean off the charred black flux. This can be done with a quick wipe on a damp sponge or rag. It has to be a real sponge, as the hot iron will burn through a synthetic one.

Now this may seem strange, but after wiping off all the flux and excess solder, you need to put a little back. Use 22 swg – standard wire gauge – solder, as other gauges tend to be too thick for electronic work and you will end up using too much.

All you want to do is wet the tip. Just touch the solder very briefly on the tip of the iron, giving a thin film of solder. This means that when you touch the tip on to the joint there is not just one thin point of contact with the tip but a small contact area.

This will aid heat flow and allow the joint to warm up evenly to the correct temperature. However, don't overdo it. Most beginners pile a great blob of solder on the tip and hope it will work.

The trick of good soldering is to bring together all three components simultaneously, the solder, the iron and the joint. Don't melt the solder on the tip or try to melt the solder from the joint, but all three together.

Now this is the important bit. The solder will start to melt and when sufficent has been applied, remove the solder leaving just the iron and the joint together.

Look closely at the joint, in a second or so you should see the flux run round it, when this happens the joint is hot enough and it is time to remove the iron. Don't move it while it is cooling or you will spoil the joint. A badly soldered joint is a poor electrical connector and is known as a dry joint.

Most soldered joints fail because the joint has not been made hot enough or there is the wrong amount of solder. The latter is the most difficult to judge. Most beginners go through a phase of putting

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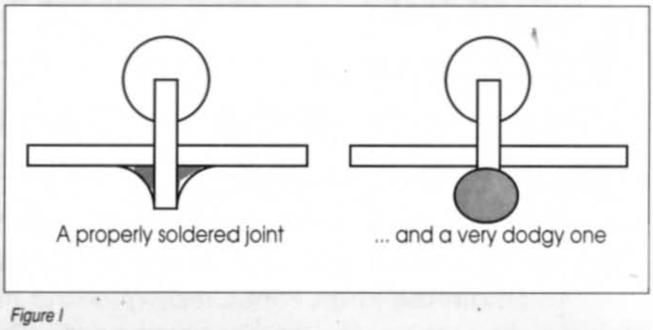
A properly soldered joint

... and a very dodgy one

Figure I

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too little or too much on. As a guide as to the right amount look at your micro's printed circuit board. When finished your joint should be bright and shiny not dull and frosty.

Another common mistake when soldering to a printed circuit board is to have the iron only touching the component lead and not both the lead and track. When this happens the solder goes into a ball and a layer of flux sits between it and the track, effectively insulating it. A good joint will show a smooth concave fillet – see Figure I.

Now we have learnt to solder let's see how to wire an external switch to the keyboard. First of all, remove the keyboard. This involves taking the lid off the micro, disconnecting the ribbon cable leading to the main board and removing the two bolts holding the keyboard down.

Now turn it over and look at the soldered connections. All the keys will have two large wires underneath them. It is to these that we want to attach our extra key via an extension wire.

Don't use solid core wire as this will break inside the insulation after being flexed a few times. Use stranded wire, which comes in many sizes. The most convenient one is called 10/0.1 which means 10 strands of 0.1mm wire.

First you have to prepare the wire. Strip off about 1cm of insulation and grip the exposed wire between finger and thumb, then twist the wire with your other hand.

Now apply the soldering iron to the bare end and just touch it with the solder. You will see the solder flow between the strands – sucked in by capilliary action. Take a pair of side cutters and snip off all but about 4mm, this removes the ball of solder that tends to gather at the end.

Lay the end of this wire next to one of the key's solder pins and apply the iron and a very little extra solder. When the solder fillet round the key melts, push the wire next to it and remove the iron, making sure not to move the wire as it cools. The result is shown in Figure II. Now repeat this for the other side of the key.

Prepare the other ends of the wire as before, only leave slightly more of the exposed wire. Now take your pliers and make a U bend in the wire, wrap it round the connector of your switch and very gently squeeze it into contact.

Ideally there should be some sort of mechanical contact before attempting to make an electrical one – try to avoid making the solder take the mechanical strain. Then apply the iron and solder to get a good electrical joint.

As most games use four keys you will have to repeat this process for each key you want to extend. When replacing the keyboard's ribbon connector make sure that you align the pins and holes up exactly, don't be left with a pin extra at one end or your micro will refuse to work.

To make the result a little neater you can use multi-core cable. In order to make this easier I have put together Body Build Pack No. 61 which contains a length of eight core cable, some solder and four key switches. It also contains the four diodes needed for the next circuit – see the order form at the end of the article.

Note there is no box included to mount the switches in, as this is where your imagination and creativity comes in.

You can if you wish simply connect them to the lid of a box, or you can mount them in different ways. For example you could mount two switches vertically and by moving your hand or finger from side to side switch one or the other.

Those who do not want to be so drastic as to attach the keys directly to the keyboard can connect them via the user port.

In this case you will also need a small machine code program that will read the user port and put the appropriate code into the input buffer. This will work with the Basic GET command and most programs.

However, some games bypass the operating system software and look at the keyboard directly, so this method will not work. Also you need to find some area of memory for the patch that the program is not using.

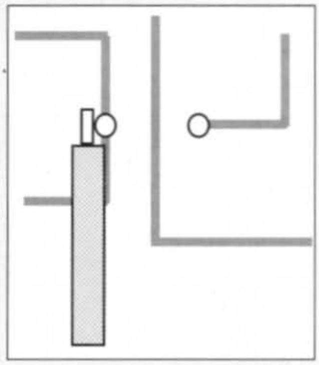

Figure II: Adding a wire to the keyboard

Figure III shows the theoretical diagram of the four input switches. The simplest way to make this is using the transition board and connecting cable, Body Build Packs 1 and 2. This already contains the 47K pull-up resistor and so all you need to do is to connect the switches to the screw connectors. A practical diagram of this is shown in Figure IV.

As well as each key putting a logic zero on the appropriate bit of the user port input it also pulls down the CB1 line, to generate an interupt and tell the micro a key has been pressed.

We need to use a diode to connect each switch to this line. A diode will only allow electricity to flow in one direction and so will not allow the earth connection to get back on any of the other switches.

The software is shown in the listing and

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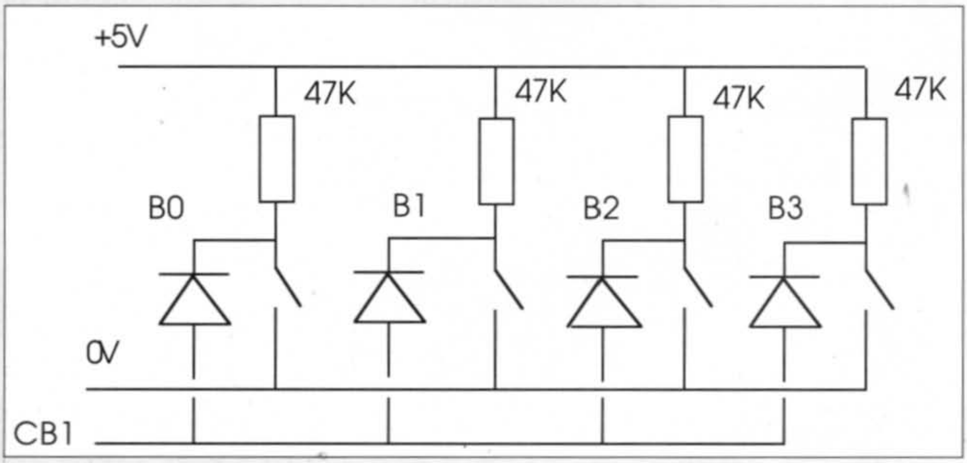

Figure III: diagram for 4 user port key switches

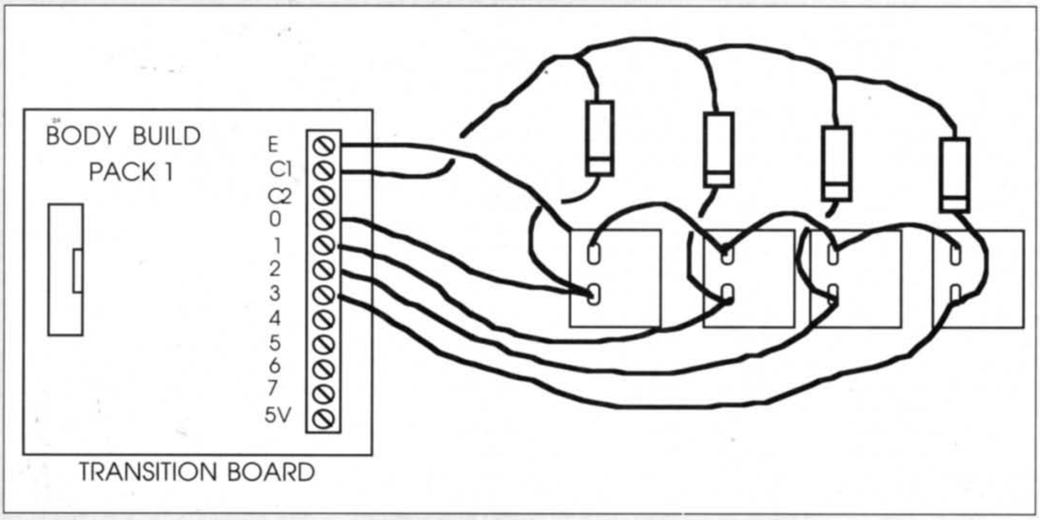

Figure IV: Practical wiring for figure III

will assemble a patch and place it in memory at an address given in line 70. The decimal Ascii codes corresponding to the keys are contained in lines 660 and 670. These are simply the numbers 0 to 3, but you can change them to be any keys you want. For machine code simplicity there are a number of zeros in these two lines. You can experiment by replacing the zeros with other Ascii codes, which will be activated when certain combinations of keys are pressed.

Any key pressed produces a falling edge on line CB1 of the user port. This generates an interrupt and the interrupt service routine looks at the user port and places the appropriate code in the input buffer.

- *I hope that has helped the beginners and taken the fear out of interfacing. Until next month, happy key pressing.*

In the May issue the price of the assembled PC monitor adaptor was erroneously listed as £38. It should have been £18

```
   10 PRINT"THE BEEB BODY BUILDING COURS
E"
   20 PRINT"By Mike Cook"
   30 PRINT
   40 PRINT"User Port extra keys patch"
   50 OSBYTE=&FFF4
   60 FOR PASS%=0 TO 2 STEP 2
   70 P%=&A00
   80 [
   90 OPT PASS%
  100.INIT
  110 \ INITIALISE PATCH
  120 LDA #&00
  130 STA &FE62 \SET UP DATA DIRECTION R
EG
  140 LDA &FE6C \ENABLE CB1
  150 AND #&EF  \ON FALLING EDGE
  160 STA &FE6C
  170 LDA #&90  \ENABLE INTERRUPT
  180 STA &FE6E
  190 LDA &206 \ MOVE IRQ2 VECTOR
  200 STA VEC2
  210 LDA &207
  220 STA VEC2+1
  230 LDA #ENT1 MOD 256 \ PUT IN IRQ2
  240 STA &206          \ VECTOR PATCH
  250 LDA #ENT1 DIV 256
  260 STA &207
  270 RTS \BACK TO BASIC
  280.ENT1 \ INITIAL INTERRUPT ENTRY
  290 JSR SCAN \ READ KEY AND PLACE IN B
UFFER
  300 TAY \ TRANSFER KEY CODE
  310 JSR K INSERT \ INSERT TO BUFFER
  320 LDA &FE6D \ REMOVE ANY INTERRUPT
  330 STA &FE6D
  340 LDY #40 \DELAY LOOP FOR CONTACT BO
UNCE
  350.DE1 LDX #&FF
  360.DL NOP
  370 DEX
  380 BNE DL
  390 DEY
  400 BNE DE1
  410 LDA &FE6D \ CLEAR ANY BOUNCE INTER
RUPTS
  420 STA &FE6D
  430 JMP (VEC2) \ ON YOUR WAY
  440.K INSERT \ INSERT TO BUFFER
  450 LDA #&99
  460 LDX #0 \KEYBOARD BUFFER
  470 JSR OSBYTE
  480 RTS
  490.SCAN \READ KEYPAD
  500 LDA &FE60
  510 AND #&0F \REMOVE UNUSED BITS
  520 EOR #&0F \INVERT INPUT
  530 TAX
  540 LDA LOOK,X \ GET THE CODE FOR THAT
 KEY
  550 RTS
  560.VEC2 NOP:NOP
  570.LOOK \THE LOOK UP TABLE STARTS HER
E FOR 16 BYTES
  580]
  590 NEXT
  600 FOR A=LOOK TO LOOK+15
  610 READ B
  620 ?A=B
  630 NEXT
  640 REM DATA FOR KEY TRANSLATION
  650 REM Alter these to suite your own
keyboard
  660 DATA 0,48,49,0,50,0,0,0
  670 DATA 51,0,0,0,0,0,0,0
  680 CALL INIT
  690 PRINT"Patch now installed at &";~E
NT1
  700 PRINT"Press BREAK to remove"
  710 PRINT"Now type in NEW"
```

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Find out its limits. Look in the mirror.

ATARI
1040STE
ATARI SM124
ATARI 1040STE

Introducing the powerful new Atari 1040 STE. With such an awesome machine, we're convinced the only limits you'll come across are your own.

Based on the incredibly successful 1040 STFM, the 1040 STE itself goes beyond the limits of its predecessor.

The 'E', by the way, stands for 'Enhanced'. But once you've discovered its amazing array of features, you may consider 'Enhanced' to be the understatement of the decade.

Perhaps the most outstanding feature of the 1040 STE is its graphics. Its palette contains over 4000 colours (all right, 4096 to be exact).

To ensure precise and realistic images, the STE features 'hardware scrolling', enabling smooth scrolling in any direction and split-screen effects. And, with the SM124 monitor, you'll get razor sharp black-out-of-white text that's as clear as the type on this page.

To complete the picture, it is able to 'phase-lock' its video output to an external video source, permitting direct linking to a Genlocking device.

ST SERIES
LEISURE SOFTWARE
ST SERIES
PRODUCTIVITY SOFTWARE
FirST BASIC
HYPERPAINT
ATARI

The 1040 won't just have your eyes swivelling in their sockets. Your eardrums will also take a pounding from the 8-bit PCM stereo sound.

The new PCM (Pulse Coded Modulation) sound system's two chips allow the 1040 STE to replay high-quality sampled sounds, in stereo, without burdening the CPU. Or, for even more of an earblasting, just add a couple of RCA output jacks and power the sounds through your own stereo.

Of course we mustn't forget memory. One megabyte of RAM comes as standard. If that's not enough, the 1040 STE provides four SIMM sockets. Simply plug in some SIMM (Single In-line Memory Module) boards and boost the RAM up to four megabytes.

To help you handle all this technology, we've added even more: a Blitter chip, capable of shifting data at high speeds independent of the CPU, and a new version of TOS.

The TOS 1.6 (operating system) has an enhanced file selector with drive-change buttons, improved desktop with file move, MS-DOS compatible disk formatting, and better application installation and auto-booting facilities.

As you'd expect, there's a huge range of peripherals including hard disks, floppy disks, laser printers, colour monitors and even Megafile 44, Atari's unique 44-megabyte removable hard disk.

As well as all this hardware, there are hundreds of software programmes for the 1040 STE - we're even throwing in the ST-Series Productivity and Leisure bundles free.

The Productivity bundle features a database, spreadsheet, word processor and business graphics package, and there's S.T.A.C., FirST BASIC, Hyperpaint and Prince in the Leisure bundle.

If you're itching to get your hands on the controls, there are two 15-pin analogue controller ports (which accept paddles, light-guns and light-pens) and a 9 pin mouse port and joystick port.

With adaptors, up to six people can use the 1040 at one time. Just in case it's too much for one person to handle.

At £499.^{99} it certainly won't be too much for one person to afford.

The ideal computer at the ideal price, you may think. We think so, too. But there remains only one potential problem: not whether you'll make impossible demands of the 1040, but whether the 1040 will make impossible demands of you.

Please send me further details of the 1040 STE and other Atari products.

NAME: --

ADDRESS: --

-- POSTCODE --------

Please send to Atari Corp (UK) Ltd. Atari House, Railway Terrace, Slough, Berkshire. SL2 5BZ.

ATARI 1040STE

WITHOUT IT YOU'RE JUST PLAYING GAMES

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Jessa House, 250 Lower High Street, Watford WD1 2AN, England
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Acorn The choice of Experience

The choice before and after the experience

Archimedes micro

System	Basic	Mono	Colour	Multiscan
410/1	£1099	£1159	£1288	£1488
420/1	£1499	£1559	£1678	£1888
440/1	£2099	£2159	£2278	£2488

(Securicor carr. £10 on Archimedes)

12 MONTHS FREE MAINTENANCE ON SITE

Archimedes A3000

● A3000 Microcomputer	£599
● A3000 + Learning Curve pack	£699

● 3.5" External Drive	£99	● Dust Cover Micro only	£5
● Monitor Stand	£22	● Dust Cover for Micro + Monitor	£9
● External Podule Case	£14	● User port/MIDI upgrade	£49
● Serial Upgrade	£19		

Unbeatable SUMMER SALE

Offers on Archimedes Micro

(Extended by Popular Demand)

When you purchase an Archimedes Micro from Watford, look what you get FREE with it

Micro	Free Offer
A410/1	Upgraded to 2MB RAM & a 20MB Hard Disc, (A420)
A420/1	Upgraded to 4MB RAM & a 40MB Hard Disc, (A440)
A440/1	ATAXAN775+14" Multisync Monitor
A3000	Upgraded to 2MB RAM on board

+ 12 months FREE On-Site Maintenance

ACCESSORIES

● NEW Multitasking RISC OS	£29
● ROM Podule Acorn	£45
● ROM Podule (Computer Concepts)	£45
● ROM Podule (C C) with Battery Backup	£59
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● 5.25" 800K external Floppy Drive	£85
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● MIDI Expansion Card	£65
● Sound Sampler Mono (Armadillo)	£129
● Sound Sampler Stereo (Armadillo)	£166
● Sound Sampler Stereo /Midi (Armadillo)	£186
● Chromalock Podule (Wild Vision)	£275
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● 16 bit parallel I/O Card	£195
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● Keyboard Extension Lead	£6

Archi Books, see page 12 of our advert

NEW

A3000 LEARNING CURVE

A very special offer pack consisting of the A3000 Archimedes microcomputer package plus:

First Word Plus wordprocessor and spelling checker, IBM PC Emulation package, Genesis applications, which contains: GEN DTP, Address & phone book, Scrap book, Recipes, Composers, Green issues, Planets, Story writing and Personal organiser. A demonstration Video Cassette and A parent's guide to the National Curriculum. All this plus Watford's incredible deal of a FREE upgrade to 2MB of RAM and FREE on-site maintenance cover for 12 months.

Turbo Charge Your Archimedes

(at an affordable price)

Increase the speed of your Archimedes by a factor of THREE to SIX times (depending on the software you are running), with Watford's ARM3 Upgrades.

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● MEMCI Upgrade	£49

Convert your Archi 410 to a 420 or 440 with Watford's unique Upgrade Kits

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UP30 – to 4MB RAM + 40MB Hard Disc	£539
UP40 – to 4MB RAM + 53MB Hard Disc	£599

(P.S. When purchased with an A410/1, the upgrades will be fitted at no extra cost)

Archimedes RAM Upgrade

All our memory upgrades are simple to fit. No soldering required.

● R302-A3000 – to 2MB RAM Upgrade	£95
● R304-A3000 – to 4MB RAM Upgrade	£299
● R311-A305 – to 1MB RAM Upgrade	£99
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● R314-A305/310 – to 4MB RAM Upgrade	£499
● R412-A410/1 – to 2MB RAM Upgrade	£85
● R414-A410/1 – to 4MB RAM Upgrade	£255

(Carriage on Add-ons £3)

Watford's 20Meg & 40Meg Archimedes Hard Disc

Watford Electronics' 20Meg & 40Meg hard disc fits internally into the Winchester slot provided.
It is fully compatible with Acorn's hard disc upgrade, (the only difference is our low price). Price includes the Hard Disc Drive, Controller Podule & fitting instructions. (Self parking fast hard drives.)
P.S. The 310 upgrade requires a backplane and a fan.

● 3HDP – Hard Disc Podule only	£175
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● 3HD40 – 40Meg H' Disc + Podule for 310	£439
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● 4HD40 – 40 Meg Hard Disc for 410	£285
● A3000 Hard Disc Podule only	£195
● A3000 20 Meg Hard Disc + Podule	£369
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(Carriage £7)

Desk Top Publisher

Acorn's Archi DTP Package	£125
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Wordwise + Disc	£20	P.Spellchecker	£40
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AlphaBase	£36	Interbase Disc	£20
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(P&P on above £2)

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Conqueror	£19	Zarch	£15
Enthar Seven	£22	**Miscellaneous**	
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ISO-PASCAL; FORTRAN 77	£89 each
ANSI C Release 3	£129
Assembler; LISP or Prolog X	£155 each
LOGOTRON LOGO	£55

ROBO LOGO	£54	TWIN EDITOR	£25
RISC BASIC	£85	BASIC Compiler	£89

(P&P £2 on above packages)

MINERVA's Archimedes Software

Sigmasheet	£55	Sales Ledger*	£53
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Gammaplot	£50		
System Delta+	£55		

System Delta + Reference Manual	£25
Order Processing/Invoicing*	£53
School Administrator	£118

** Requires System Delta*
(P&P on above items £2)

Archimedes to BBC Serial Link Mk 2

Using this simple data link, it is possible to solve all your BBC to Archimedes data transfer problems. The kit is supplied with a disk, and the necessary cable to connect the two computers.

New RISC OS Version **Only £15**

Archimedes 5.25"/3.5" Disc drive Interface

With this interface it is possible to connect almost any 5.25"/3.5" disc drive with its own power supply to the Archimedes. Upto 4 disc drives can be connected. NO SOLDERING is involved. Supplied complete with necessary lead.

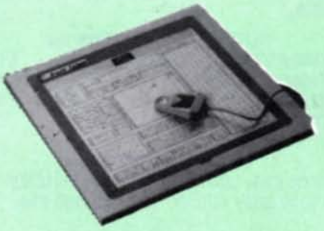
Only £21

FREE On-Site Maintenance

This month we are also offering at no extra cost to all our customers, 12 months, On-Site Maintenance on all Archimedes Micros, Philips, Microvitec, and Multiscan COLOUR Monitors. Also on the full range of Panasonic Printers.

Should your machine fail, simply telephone the maintenance engineer, who will call in within 12 working hours to repair the unit. (P.S. This offer is over and above our Unbeatable Winter Sale Offers on Archimedes Micros). (Offer applicable only when bought at prices advertised in this advert).

Archi Graphic Tablet



This package allows Archimedes users to take advantage of the low cost graphpad (sometimes called a digitiser tablet, but not to be confused with a video digitiser!)

The Archi Graphpad offers performance and accuracy comparable to other graphics tablets priced at well over £400, and has the useful addition of a liftable cover, which can hold tracing material or menu templates securely.

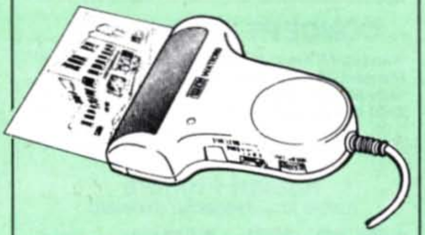
The software, which is in the form of a relocatable module (RM), intercepts the system calls which control the mouse, and so allows virtually all mouse based Archimedes software to be controlled using the tablet without any modification. The only exceptions are programs which use the serial port, as the tablet is physically connected to this port itself.

The software is supplied with a special adaptor lead to connect the tablet to the Archimedes' serial port, and a power lead which plugs onto the Archimedes' main board.

(For further details, please telephone or write in for our FREE catalogue.)

Special Price £249 (carr. £4)
(Price includes Tablet, Leads & Software)
Stylus Optional Extra **£29**

Archi Mk II Hand Scanner



Watford Electronics is now able to offer a complete hand held scanning package, possibly the most essential addition to any desk top publishing system. The package includes the most comprehensive utility software available for the Archimedes, a high quality, ergonomically designed to fit the shape of your hand, (see drawing above) scanner, which is fitted with a warning LED that will indicate if the scanner is being moved too quickly for accurate results. Additional twin guide rollers ensure precise tracking over the image, to make the best use of the high resolution available with this sytem. The yellow/amber illumination of our Mk II scanner, enables you to achieve optimum accuracy. It is capable of scanning upto an amazing 400 DPI. The scanning area is 4" wide and the height is only limited by the maximu amount of memory available.

On board ROM software supplied, is the most sophisticated Archimedes scanner software yet written.

AHS-4	**Archi 300/400 Version**	**£149**
AHS-3	**Archi A3000 Version**	**£175**

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

Z88 Portable Micro

Only: **£195** (Carr £4)

FREE

With every Z88 purchased from us, we are giving away absolutely FREE, a Z88 to BBC Interface Link, 4 rechargeable batteries and a compact Mains Battery Charger worth £38.

ACCESSORIES

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● 512K RAM Pack	£175
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● Z88 Carrying Case	£9
● Z88 Computing Book	£9.95
● AA Nicad Rechargeable Battery	£1.50
● Battery Charger Compact & Fast	£6
● Z88 Serial Printer Cable	£9
● Z88 Parallel Printer Cable	£25

● Z88 to BBC Link	£20	● Z BASE	£56
● Z88 to PC Link II	£30	● Z TAPE	£42
● Z88 to Macintosh	£52	● Z TERM	£42
● Z88 Mains Adaptor	£9	● Z88 Modem	£149

By popular demand, we are now supplying refurbished and fully guaranteed BBC Micros with Disc Filing System
(Please telephone for price & availability)

ULTIMUM – Archimedes A3000 Podule Racking System

When Acorn originally designed the Archimedes micro, they released to all interested parties the specification of the expansion podule. This has now become the accepted standard for all manufacturers of Archi peripherals. The A300 & A400 both allowed expansion internally up to 2 or 4 podules. However, a newcomer to the affray has caused some upset. A3000 has only a single podule expansion slot, on the outside. There has been deliberation in the industry about a controversial "mini-podule" to be fitted to a special rack. This would entail a re-design of all the available podules onto a smaller board and understandably the manufacturers have rejected the idea completely. As always, Watford have come up with the only real solution to the A3000 expansion problem. The Ultimum Podule Racking System allows up to 3 full size standard A300/A400 series podules to be fitted to the computer. There is also provision for a hard disc drive and podule. Ultimum has its own PSU. There is also an IEC mains output socket for a monitor. It mounts on top at the rear of the computer, and allows direct access to the floppy drive and reset button, rather than obstructing access as on other non standard systems.

Watch this space for launch details.

BBC MASTER

MASTER 128K Micro incl. Acorn's View, Viewsheet, ADFS, BASIC Editor & TERMINAL plus FREE OFFER (see below) £399*(carr £7)*

FREE OFFER

A 5.25" Double Sided, 40/80 track switchable 400K Disc Drive complete with cables and a Utilities disc incl. 2 games, plus

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FREE with every BBC Master purchased from us during June

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ALL ECONET UPGRADES Available	
ARIES' IEEE Interface for BBC B & Master	£238
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(Carr. £2 to £7 depending on the weight)

Continued→ → → → → → → → →

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- **TAXAN** Super Vision 3 – High Res 12" Colour Monitor/with green screen switch for wordprocessing
  Special Offer £179 (While stocks last)

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STAR BUY

- **PHILIPS 14" Medium Res, dark glass,** attractively finished Colour Monitor. A push-button switch toggles between Hi-Res monochrome green text mode and full colour display. (Please state the type of Connecting Lead you require).

ONLY £189

- **PHILIPS 14" Refurbished monitor, same as** above at a special offer price Only **£120**
  (Offer valid while stocks last)

Dust Cover for Philips Monitors **£6**
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SWIVEL BASES

By simply placing your monitor on one of our front adjustable professional swivel bases (see drawing at the top), you can easily adjust the viewing angle.

for 12" Monitors £8 (carr. £2.50)
for 14" Monitors £12 (carr. £2.50)

Anti Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for wordprocessor users.

£12

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Archi A4 Keyboard	£118

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(Official Roland Appointed Distributor)

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Panasonic KX-P1081

12 MONTHS FREE MAINTENANCE ON SITE

SALE OFFER only: **£127**

(Price includes, FREE a 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every KX-P1081 printer purchased from us)

KX-P1180 Printer Offer

Panasonic KX-P1180 printer, Dump Out 3, Screen Dump ROM & a BBC printer lead.

Offer Price £136

Panasonic Printers

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- **Panasonic KX-P4450I** LASER PRINTER
  Latest technology at Watford's special offer price **£1,299**

● Spare Toner	£29	● A4 Feeder	£55
● Drum Unit	£149	● Developer	£115
● 1MB RAM Upgrade			£299
● 2MB RAM Upgrade			£585

Panasonic Accessories

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KX-P1592/1595 (P32)	£175	KX-P1540 (P35)	£175
KX-P1124 (P36)	£85	KX-P1180 (P37)	£79

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Guaranteed to last 3 million characters

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Colour Ribbons for KX-P1081, 1592 & 1595
Brown, Blue or Red **£9.95 each**

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● Colour Jet 132 Printer	£515
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● Colour Cartridge	£19.50
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● 8K Serial Interface Optional	£123

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NEC PINWRITER P6/P7 Plus

NEC P6+ 80 columns	£439	**NEC P7+** 136 columns	£575
Colour Option	£74	Serial Interface	£73
Cut Sheet Feeder	£125		
NEC Ribbons for		P6 £8;	P7 £9.50

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HP Paint Jet Colour	£719
HP LaserJet Series IIP	£829
HP LaserJet Series II	£1235
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HP Scanjet Plus	£1199
HP Desk Writer	£669
HP Laserjet II	£1275
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1Meg RAM for Series II	£199
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12 months FREE maintenance on site

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LC24-10	£199	XB Colour Kit	£35

Cut Sheet Feeder

LC10/LC24-10	£65	LC15/LC24-15	£125
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EX800	£429	LQ860 Colour	£535
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FX850	£315	LQ1060	£649
FX1050	£385	LQ2550+	£899
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LQ400	£198	SQ850	£515
LQ850	£439	SQ2550	£869
LQ550	£269		

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LX400/800/850/LQ400/500/550	£69

TRACTOR FEED for

LQ800 **£44**; LQ850/FX850 **£69**; LQ1050/FX1050 **£85**; LQ2500 **£90**; LQ2550 **£90.**

ACCESSORIES

● EX800/1000 Colour Option	£45
● EX800/1000 Colour Ribbon	£14
● LQ2500 Colour Option	£65
● Multifont Card for LQ550/850/1050	£95

(Securicor Carriage on Printers £7)

EPSON PRINTER INTERFACES

All these interfaces fit inside the printer

RS232	£32	RS232 + 2K Buffer	£52
IEEE 488	£40	RS232 + 8K Buffer	£79

PRINTER LEADS

BBC Centronics 4' long	£5
BBC Centronics 6' extra long	£7
Compact's Special Centronics Lead	£7
Archimedes Printer Lead 6'	£6
Nimbus Centronics Lead	£6
IBM Parallel Lead 6'	£6
Double Ended 36 way Centronics Lead 4'	£7
Double Ended 36 way Centronics Lead 6'	£9
MSX Centronics Parallel Lead 4'	£12
RS232 Leads (Various)	P.O.A.

Listing Paper (Perforated)

● 1,000 Sheets 9.5" x 11" Fanfold Paper	£7
● 2,000 Sheets 9.5" x 11" Fanfold Paper	£11
● 1,000 Sheets 9.5" x 11" NCR 2 Part Fanfold	£21
● 1,000 Sheets 15" x 11" Fanfold Paper	£9
● 1,000 Sheets true A4 Fanfold Paper 70gms	£11
● 2,000 Sheets true A4 Fanfold Paper 70gms	£19
● Teleprinter Roll (Econo paper)	£4

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50, 2K Sheets £3.00

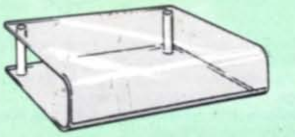
PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90 x 36mm (Single Row)	£5.00
1,000 90 x 36mm (Twin Row)	£4.90
1,000 90 x 49mm (Twin Row)	£7.50
1,000 102 x 36mm (Twin Row)	£6.25

Carriage on 1,000 Labels £1.00

Perspex Printer Stand



Give you Computer System a touch of Class with our elegant, smoke finished Perspex Printer stand.

80 Column version	**£16** (carr £3)
136 Column version	**£20** (carr £4)

Professional Printer Stand

The professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Its ergonomic design ensures smooth paper flow and automatic refolding.

80 Column version £28 (carr. £3)
132 Column version £30 (carr. £4)

Printer Ribbons & Various Dust Covers

Type	**Ribbons**	**Dust Covers**
Brother HR15/20	**£3.00**	**–**
BBC Micro	**–**	**£3.50**
BBC Master	**–**	**£4.00**
Archimedes Micro pair	**–**	**£9.00**
Citizen 120D	**£3.95**	**£4.50**
DMP2000	**£3.75**	**£4.75**
EX/LQ800	**£4.50**	**£4.50**
EX/LQ1000	**£6.75**	**£5.00**
RX/FX80/85/800/MX80	**£3.25**	**–**
FX/MX/RX100/1000	**£5.00**	**–**
Kaga/Taxan KP810/815	**£4.90**	**£5.00**
LQ500/550/800/850	**£4.50**	**£6.00**
LQ1050/LQ2500	**£7.00**	**–**
LX80/86/800/850	**£3.25**	**£4.50**
M1009/GLP	**£3.80**	**£3.75**
NEC P2200	**£6.00**	**£5.00**
Panasonic KX1080/81	**£3.50**	**£4.75**
Panasonic KX-1124	**£8.00**	**£5.00**
SQ2500	**£23.00**	**£5.50**
Star LC10/NL10	**£4.25**	**£5.00**
Star LC24-10	**£5.00**	**£6.00**
Olivetti Ink Jet Cartridges (set of 4)	**£9**	

Our attractive Dust Covers are manufactured from translucent PCV. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Universal Printer Sharers/Changer

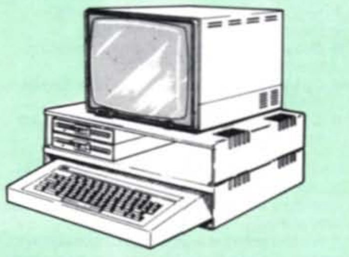
Connect upto 5 Micros to 1 printer or 5 Printers to 1 Micro with our combined, Sharer/Changer. These Units are made to a very high standard. For extreme reliability, they all have Printed Circuit Boards mounted inside the case, (not a Spaghetti Junction of wires). Internal connection is made via high quality ribbon cables.

(Ideal for School environments)

Connects	**Serial**	**Centronics**	**P&P**
2 to 1	£20	£22	£3
3 to 1	£27	£30	£3
5 to 1	£36	£39	£4

(Cables extra at £6 each. Please specify type required when ordering)

PLINTHS FOR BBC MICRO, MASTER & PRINTERS



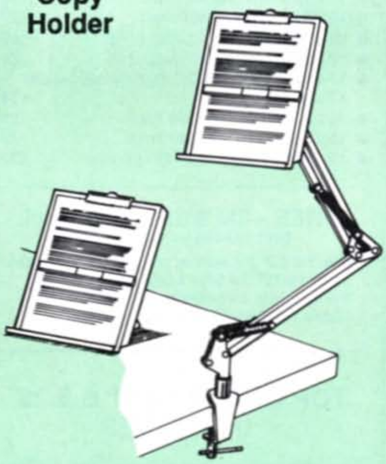
Protect your computer from the heat of your VDU. Our micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and VDU, whilst the double height version provides enough room for our stacked disc drive and other peripherals like, Eprom programmer, music unit or simply discs & stationary. The computer slides neatly in the lower section allowing easy access to remove the lid.

The single printer stand is equally sturdy but instead of cooling slots it has elegant cutouts on the sides. This allows easy access to paper from all sides. Colour: BBC Beige.

Single BBC Plinth	420 x 310 x 105mm **£13**
Double BBC Plinth	420 x 310 x 210mm **£24**
Printer Plinth	420 x 310 x 105mm **£12**
Single Master Plinth	490 x 310 x 105mm **£14**
Double Master Plinth	490 x 310 x 210mm **£26**

(Carr. Single plinth £2; double plinth £3)

Copy Holder



Whether you want to type in your latest program or the draft of a new trilogy, Watford's manuscript holders are superb for holding you paper at the ideal height and angle to allow you to read and type in ease and comfort.

Available in 2 full A4 versions, desk resting and shelf clamping. Paper is held firmly by means of a plastic retaining ruler and a clip grip. (for resting books or magazines, the desk top version is recommended).

Desk Top **£7** (carr. £3)
Angle poise **£12** (carr. £3)

Handy Printer Switch

A handy two way compact printer switch that enables you to connect 2 Micros to 1 printer, or 2 printers to 1 Micro. Attaches easily to your printer, monitor, etc. A low cost solution for educational establishments. Ideal for those wishing to use a dot matrix and a laser printer. Available in two configurations.

Compact AB Switch Centronics	**£19**
Compact AB Switch RS232	**£18**

(Cables extra at £6 each)

MEGABUFFER 256

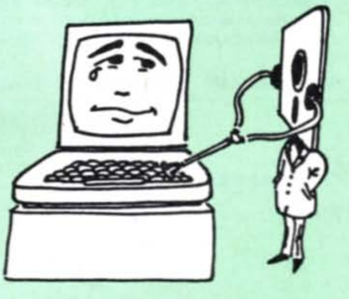
The Smallest 256K Printer Buffer Unit in the world **38mm x 130mm x 134mm.**

This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. The features are:

- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatiblity with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in text unit for both the buffer & your printer.

Only £119 (carr £5)

DIAGNOSTICS DISC



The BBC Micro is a very complex machine and thus diagnosing a fault can be very difficult. At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:

RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

(Only suitable for BBC B with 8271 DFS)

Continued→ → → → → → → → →

Archimedes Real-Time Digitiser

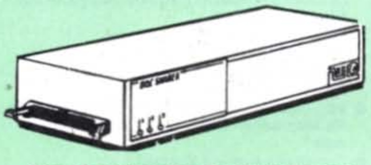
Now supplied with NEW RISC OS Version Software

Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air televison signals may also be digitised via a video recorder or TV tuner. Please write for further details.

Price £215

A Set of Colour Filters for colour image grabbing using a video camera	£16
New Risc-OS Software Upgrade	£39

DISC DRIVE SHARER

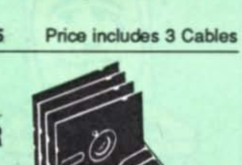


(Ideal for educational establishments)

At last, a low cost alternative to the Econet system.Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not for use with ADFS.)

Offer Price : **£55** Price includes 3 Cables

DISC PLONKER RACK



When using ones micro, there is a tendency to have more than one Disc on the desk. This exposes them to the harzards of fingerprints, scratches, dust, coffee and an untidy desk.

Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. Holds up to eight 5.25" discs.

Protection at Only: **£2**

Acorn & Watford DFSs

● Watford sophisticated DFS ROM	£16.00
● Watford DFS Kit complete	£69.00
● We will exchange your existing ROM for Watford's ultimate DFS ROM at only	£12.00
● DFS Manual (comprehensive)	£6.95
● Acorn DNFS ROM	£17.00
● Acorn ADFS ROM only	£25.00
● Acorn 1772 DFS ROM Kit	£49.00

(The single Density DFS system is now old technology. Like Acorn, Watford too have decided to replace it with the their more up-to-date 1770 DDFS interface. We have informed most of the software houses of this decision in order that they can ensure compatibility with our highly sophisticated and fully Acorn compatible DDFS).

Watford's MkII 1772

Single/Double Density DFS

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our Mk II DDFS Board with its 1770 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1770 DFS, plus the added features.

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!

If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only **£39.00.**

● SPECIAL PRICE	£44.00
● DDFS Manual	(No VAT) £6.95
● We will exchange your existing DFS Kit for our sophisticated DDFS for only	£30.00

Please note, as the MkII DDFS is a hardware and sofware upgrade, it is not possible for existing Watford DDFS users to simply exchange the ROM for the new version.

3M – DISKETTES

3M – SCOTCH Diskettes with Lifetime warranty from Watford Electonics your 3M Appointed Distributor

● *10 x 5.25" S/S D/D 40T (744)*	£5
● *10 x 5.25" D/S D/D 40T (745)*	£7
● *10 x 5.25" S/S D/D 80 Track (746)*	£8
● *10 x 5.25" D/S D/D 80 Track (747)*	£9
● *10 x 5.25" 1.6M D/S D/D High Density for IBM XT and AT*	£14
● *10 x 3.25" S/S D/D 40/80 Track*	£9
● *10 x 3.25" D/S D/D 40/80 Track*	£9
● *10 x 3.5" Double Sided High Density*	£22

FREE – 3M World Desk Clock

(with special promoted boxes)

Buy 5 x 3.5" 3M special promoted Disc boxes, or 10 x 5.25" 3M Disc boxes and qualify for the specially commissioned 3M World Desk Clock. (Offer valid while stocks last).

TOP QUALITY 3.5" & 5.25" DISKETTES

To complement our range of Quality Discs and Disc Drives. WE are now supplying SPECIAL OFFER packs of 10 Lifetime guaranteed discs. Each disc has a reinforced hub ring. Supplied complete with selfstick labels and a Plastic Library Disc Box.

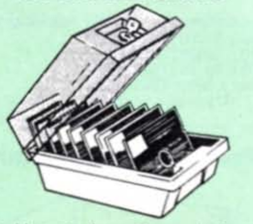
● *10 x **M3** 3.5" D/S D/D 80 Track*	£9
● *10 x **M9** 3.5" D/S High Density*	£22
● *10 x **M4** 5.25" S/S D/D 40 Track*	£5
● *10 x **M5** 5.25" D/S D/D 40 Track*	£7
● *10 x **M7** 5.25" D/S D/D 80 Track*	£9
● *10 x **M8** 5.25" D/S H/D Hi-Density*	£13
● ***M2** 3" Double Sided*	£3 each

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. it is very simple to use. Available in 3.5" & 5.25", please specify.

Price £4

ANTISTATIC LOCKABLE DISC STORAGE UNITS



Gives double protection – Strong plastic case that affords real protection to your discs.

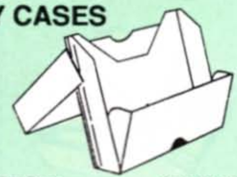
Antistatic helps avoid data corruption whilst in storage. The smoked top locks down.

Dividers and adhesive title strips are supplied for efficient filing of discs.

● **M35** – holds up to 50 5.25" discs	£4.95
● **M85** – holds up to 95 5.25" discs	£6.95
● **M25*** – holds up to 25 3.5" discs	£4.95
● **M50** – holds 50 3.5" discs	£6.50
● **M10** – holds 8 of No. 10 Data Cartridges	£15

* Not lockable

PLASTIC LIBRARY CASES



Holds up to 10 5.25" Discs. Only £2.00

DUST COVERS (For our Disc Drives)

Single CLS (without PSU)	£3.20
Single CS (with PSU)	£3.25
Twin CLD (without PSU)	£3.85
Twin CD (with PSU)	£3.90

DISC ALBUMS

Attractively finished in black leather-look vinyl. Stores up to 20 discs. Each disc can be seen through the clear view pocket.

£4

Special BULK OFFER on 5.25" DISCS

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)

PRICES SLASHED

BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
● Without Sleeves	£30	£35	£40
● With Sleeves	£33	£38	£43

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our 80 track drives are already fitted with a 40-80 select switch.

All our Disc Drives are Double Sided and will operate in both Single and Double Density modes. *Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*

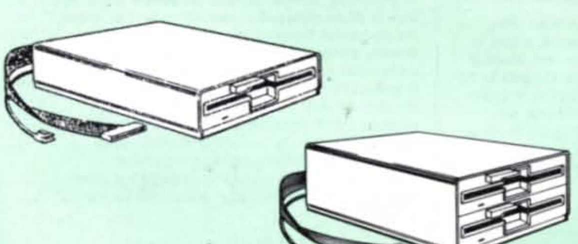
Various UK "manufacturers" of disc drives for the BBC micro (more accurately, "packagers" label other manufacturers drives with their own name). We buy the high qulity NEC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public. If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. ***Ideal for Schools & Colleges.*** *We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below are for single drives in standard single cases. Single drives in a dual case cost an extra £18. (At Watford we anticipate your needs of tomorrow, not just today!)*

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with a Watford plinth. (Turn to the 4th page of our advert for the Plinths).

P.S. All our 5.25" Disc Drives with PSU are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.

Our Disc Drives conform to BS415



"Test Bureau Approved for Use in Education"

Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
400K (720K)	CLS400S £74		CS 400S £83	
800K (1,44M		CLD 800S £149		CD 800S £162

● TWIN Disc Drive Case, complete with Power Supply & Cables £43
Securicor carriage on Disc Drives £6 to £7

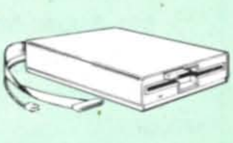
Prefix ***C*** *= Cased Drive*
L *= Less PSU*
S *= Single*
D *= Double*

Suffix ***S*** *= 40-80 Switchable*

e.g. *CLS400S = Cased Disc Drive, Less power supply unit, single 5.25" 400K, (720K in double density); Double sided; 40/80 track switchable.*

Cable to connect 5.25" Disc Drives to BBC Compact
Single £9 Twin £12
Special Cable to connect both 3.5" and 5.25" Disc Drives simultaneously to the BBC Compact £13

Special 40/80 Disc Drive/DDFS Mk II Offer



- The popular 40/80 track 400K single Disc Drive, Double Sided, cased with Cables. Plugs directly to your Micro.
- Watford's extremely popular DDFS Disc Interface (allows 720K storage). Will run in both Single & Double Density modes.
- A comprehensive User Friendly Manual.

A Bargain at Only **£119** (£7 carr) (Offer valid while stocks last)

3.5" DISC DRIVE OFFER

These top quality 3.5" Double sided, 80 track, 1 Megabyte (unformatted each Disc Drives), are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc.

Drives to connect to BBC Micros own PSU

● **CLS35 400K Unit**	**£65**	● **CLD35 Twin 800K**	**£119**

Drives with built-in Power Supply Unit

● **CS35 Single 400K**	**£85**	● **CD35 Twin 800K**	**£129**

(P.S. CS35 Single is supplied in a twin case with a blanking plate to enable easy expansion to a dual drive at a later stage).

WATFORD's WINCHESTER DRIVES

Undoubtedly the best value for money Winchester Hard disc available anywhere for the BBC Micro.

This 30 Megabyte hard disc is completely compatible with the Acorn ADFS – that's why we have bundled it with each Winchester drive, along with a Utilities Disc.

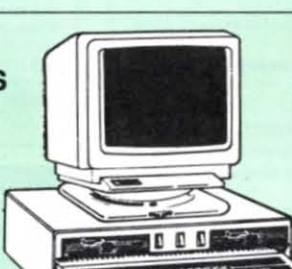
Finished in rugged metal and fetching BBC beige, the Winchester has an internal fan, so quiet you won't even hear it! A switched mode power supply and a neon-lit on/off switch are there along with a light on the hard disc to tell you when it is working – just compare the price with our competitors' 20 or 28 Mbyte discs!

Compatible with the Master, and the BBC B (with 17 X disc interface).

● 30 Megabyte BBC Hard Disc **£395** (carr £7)

CDPM 800S

DP35-800S



Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use.

CDPM 800S for the BBC B & Master £175

A Double disc drive with a difference! Times are changing fast for the floppy disk, and whilst the current standard for the BBC B and Master series is the 5.25" disk, the standard of the future will most certainly be the smaller; faster and more reliable 3.5 inch disks – now a standard feature of both the Master Compact and the Archimedes Series.

To support the present disc drive users, and cope with the future, we have designed our own plinth-mounted disk system – called the DP35 800S. It contains both the 5.25 inch and the 3.5 inch drive formats as well as offer a firm and rigid support for a monitor on top. With the BBC Micro underneath, the plinth makes a surprisingly small footprint on the desk – leaving you more space to work with.

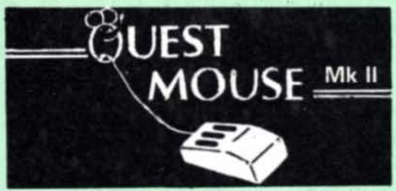
The 5.25" disc drive is 40/80 track switchable. DP35-800S has its own power supply, independent of the BBC Micro.

DP35-800S for BBC/Master £165

(Securicor Carr. £7)

(The above drive units are 2 Megabytes unformatted)

Continued→ → → → → → → → →



● Quest Mouse II & Quest Paint	£58
● Quest Mouse II, Quest Paint, AMX Stop Press & Pagefont	£89
● Quest Mouse II only	£29
● Quest Paint Software only	£34
● Quest Font Disc (22 Text Fonts)	£15
● Quest Mouse Mat (Red or Blue or Green please specify)	£3
● Part Exchange your unreliable AMX Mouse for a Quest Mouse for only	£22

(P.S. Quest Paint is not compatible with BBC Compact)

Winner of the BBC Acorn User 1990 Award for the Best Art/ Graphics software

ConQuest

Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.

Some of the features are:

- *Pick filenames off the screen for loading and saving.*
- *Rotate a cutout to any angle and Distort it to any four sided shape.*
- *Has Built in Font editor.*
- *Default brushes and patterns on startup.*
- *16 x 16 font available on start up.*
- *Ability to reset patterns, fonts and brushes to default at any time.*
- *ROM based enhanced Epson and compatible printer dump.*
- *ROM based enhanced extended picture routine.*
- *Ability to create and abort extended pictures.*
- *Improved disk access speed for extended pictures.*
- *User definable sideways RAM driver for incompatible sideways RAM systems.*
- *Ellipses at any angle on Master 128 (or B with GXR ROM).*

ConQuest ROM Package **£30**
(Price includes software in ROM and a comprehensive Manual).
(Not Compatible with BBC Compact)

NEW

ARCHI Mk II MOUSE

An extremely reliable replacement mouse for Archimedes Micro **£39**

RB2 Marconi TRACKER BALL

RB2 (AMX/Quest compatible)	£45
RB2 including Quest Paint	£75
RB2-A for Archimedes	£46

THE NEW Mk III AMX MOUSE

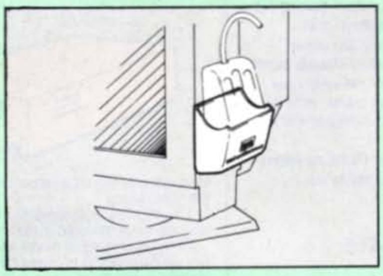
Inc. Super Art package

ONLY: £59 (carr £3)

(Please specify for BBC, Master or Compact)

MOUSE MAT	£3
AMX MOUSE ONLY	£29
AMX SUPERART Package	£34
AMX STOP PRESS – A Desktop publishing software. Works with Keyboard, Joystick or a mouse	£32
PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker	£13
AMX DESIGN (ROM)	£55
AMX XAM Educational	£15
AMX EXTRA EXTRA	£16
AMX MAX A gem of desktop (ROM)	£20

WE MOUSE HOUSE



Treat your mouse to a cosy Mouse House. This handy little gadget solves the problem of where to store your mouse when it is having a rest. Made of sturdy plastic, the WE Mouse House attaches to the side of your computer, monitor, disc drive or desk. It protects it from damage when not in use, yet within easy reach when you need it again. There is also a second compartment for your pens and pencils – and at £4 it doesn't cost a rodent's ransom.

Price £4

Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted. (Price includes FREE software Disc and Operating Manual)

Only £21

FLEET STREET EDITOR

Software pack for BBC Micro	£33
Software pack for the Master	£39
Admin Xtra Disc Utility	£13
Walt Disney Disc Utility	£13
Fonts N Graphics Disc Utility	£13

BEEB VIDEO DIGITISER

"Test Bureau Approved for Use in Education"

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem. The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional ★ commands. The package is designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROMs to work on it.

A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image. Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£109 (Carr. £5)

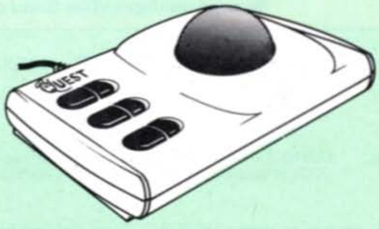
(BBC B+ and Master compatible, except Master with Econet)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual)

NEW

QUEST – Tracer ball

An attractively finished, extremely reliable, mouse replacement, input device. Requires very little desk space. Connects directly to your BBC B, BBC Master or Archimedes Micro.



QT-10 BBC/Master Version	£32
QT-20 Archimedes Version	£35

WAPPING
EDITOR
"MIGHTIER THAN THE QUILL"

Winner of the BBC Acorn User 1990 Award for the Best DTP/ Word Processor

The WAPPING EDITOR

The Wapping Editor from Watford Electronics represents a breakthrough in Desktop Publishing for the Beeb. The package includes a 64K ROM containing ALL the software needed to get into print fast; a very sophisticated graphics module, professional quality typesetting software, a word processor, a comprehensive font editor for designing your own typefaces, and a variety of printer dumps. This mouse-driven system is designed for the BBC B, the B+ and Master computers and will take full advantage of any Sideways and Shadow RAM that may be fitted. It will run under DFS, ADFS and Network filing systems and requires as a minimum just a single 40 track drive.

Included with the system is a utility disc containing several high quality fonts, various utilities and a ROM image of a Support ROM. A comprehensive 100 page manual completes the package. The Support ROM contains routines to allow an area to be rotated to any angle or distorted to any four-sided shape. Also included are facilities to draw ellipses at any angle and sectors, segments and arcs (in Master or BBC B with Acorn GXR). Another of the features of the Support ROM is a 'Turbo DFS' which gives DFS access times comparable with those of ADFS.

PAGE LAYOUT SECTION

The Wapping Editor may be used to create pages of any size from an A6 to a full A3 page. If none of the eight default page types suit your purpose, the stand-alone page creation program may be used to create pages to your own requirements. By using proportionally spaced fonts and genuine microspacing it is possible to print over 150 characters across an A4 page. A unique feature of the Wapping Editor is the 'A5 x 2' page size allowing two A5 pages to be printed side by side onto a single A4 sheet.

The graphics module is a mode 0 version of the highly acclaimed Quest Paint package, and incorporates all the same drawing facilities, e.g. pencil, brush, airbrush, polygon, circle, ellipse, fill, cut-and-paste, etc., etc.

Text may be typeset, either justified or unjustified, in any font anywhere on the page. Simply select which font and text document you wish to use, and pull out a rectangle on the page where you want the text to be – it's as simple as that! Multiple columns may be printed just as easily and a special 'expand' feature may be used to expand the microspacing so that the document exactly fits the space defined.

WORD-PROCESSOR

The integral word processor is the ideal tool for producing your text documents, although text can of course be read in from any of the other popular word processors such as View, Wordwise etc.

cont./-

THE FONT EDITOR

The font editor module will allow you to design your own typefaces or to modify the ones provided on the utility disc. This sophisticated editor has numerous functions designed to take the tedium and frustration out of producing good looking, well balanced fonts. Each character may be individually proportionally spaced and characters of any size up to 16 x 16 pixels may be defined.

Upgrading to the Wapping Editor could not be easier since the font editor will convert fonts from other packages, such as Quest Paint or Stop Press (formerly Pagemaker), into Wapping Editor format and a mode conversion utility will convert any screen in modes 1, 2, 4 or 5 into a full grey-scale mode 0 screen. Pictures may also be 'grabbed' from a video source by using the Watford BEEB Video Digitiser, either independantly or from within the Wapping Editor package.

Wapping Editor Software Pack	**£69**
Wapping Editor plus Mouse	**£89**

(Wapping Editor only works with Master Compact if a Mertec Expansion box is fitted)

Wapping Art Disc

Over 250K of clip art to cut and paste into your Wapping Editor pages. Pictures include maps, transport, people, media, sport, games etc.
Two 'ratio' screens for use with hi-res and rotated A5 pages to ensure images are not distorted when printed out.

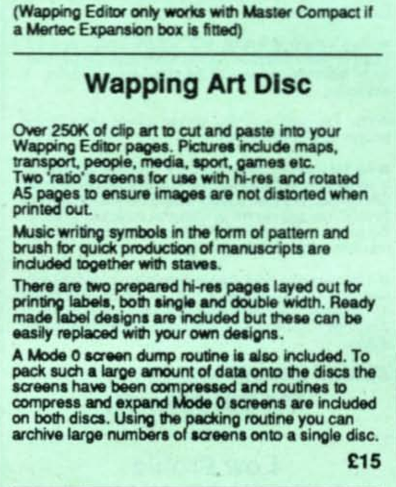
Music writing symbols in the form of pattern and brush for quick production of manuscripts are included together with staves.

There are two prepared hi-res pages layed out for printing labels, both single and double width. Ready made label designs are included but these can be easily replaced with your own designs.

A Mode 0 screen dump routine is also included. To pack such a large amount of data onto the discs the screens have been compressed and routines to compress and expand Mode 0 screens are included on both discs. Using the packing routine you can archive large numbers of screens onto a single disc.

£15

The Beeb HandScan
Hand-held Scanner for the BBC Micro



Watford Electronics are pleased to announce the launch of the first hand held scanner for the BBC Micro. HandScan is a compact unit which will allow photographs, diagrams, or any other documents to be digitised quickly and easily, to then be used in a desk top publishing package, art program, or even in your own Basic programs! These useful devices have been available for faster and more expensive micros for some time, but only now is Watford Electronics able to offer the BBC Micro computer.

The HandScan plugs directly into the 1MHz bus on the BBC while a comprehensive set of utilities provided by the sophisticated ROM firmware. The scanner has a resolution of either 100 DPI or 200 DPI when accuracy is essential. Pictures as wide as 4" may be scanned in mode 0 and various types of dithering may be selected to simulate the grey levels of a scanned picture.

All necessary software has been included in the firmware to allow the scanner to read images directly into our Wapping Editor with little more than the click of the mouse. The digitised picture may then be incorporated into your magazine, newsletter, report or any other document.

Beeb HandScan & Firmware	**£135**

Wapping Font Disc

Sixteen Wapping Editor fonts including smaller versions of Oberon and Daisy and two new sizes of the standard font.
Also included are three Mode 0 screens containing giant 'headline' fonts to cut and paste to create extra smooth headlines.
Supplied complete with instructions.

£12

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

NEW

Laser Direct
For Archimedes Micro

By using the power of the Archimedes RISC processor, it offers the best of both worlds – print speed up to 5 times faster than typical Laserjet compatibles – uses outline fonts so that any font can be scaled to any size – works with all programs that use RISC OS printer drivers. Ideal for use with Genesis, IDraw, Acorn DTP, Impression, etc. Includes 50 sheet paper tray and a single sheet/ envelope tray. Requires one expansion slot and at least a 2Mbyte Archimedes. A very compact printer, a very low initial cost and very low running costs.

Launch Offer: £949

(For demonstration, call in at our retail shop)

NEW

Beeb PC (BASIC)

Beeb PC Basic is designed for program authors wishing to convert programs so that they will run on IBM personal computers. To convert BBC BASIC programs manually can waste days of valuable time with every occurrence of common statements such as PROC, DEFPROC, TAB, having to be changed. Beeb PC (BASIC) automates many of these changes, and will convert majority of BBC statements that are invalid for IBM BASIC into equivalent acceptable statements. In addition BBC BASIC data files can be converted to IBM BASIC format, with support provided for all BBC data formats:- INTEGER, REAL & STRING.

Price: £38

NEW

Beeb DOS 2.2

The BBC and IBM PC's are the most popular micros in the UK. The BBC is firmly established in the education sector and the IBM is the industry standard in the business world. The pools of information and applications held on these computers are immense, yet the means of passing information between them are very limited. Beeb DOS provides a practical method of transferring information between these two micros.

Beeb DOS is a collection of utilities which run on the PC's and enable it to read and write information on BBC discs. You can transfer files between your PC's 360K floppy, high density floppy or hard disc and your BBC discs. In addition Beeb DOS allows you to catalogue, format and compact BBC discs and delete, re-name, lock and unlock BBC files, all on PC's. Each Beeb DOS utility is written in IBM assembler and is run directly from PC or MS-DOS. The Beeb DOS utility can be run from floppy disc, hard disc or RAM drive.

Beeb DOS is supplied on an IBM 5.25", 360K disc complete with a comprehensive operating manual.
(Will only work on 360K Disk Drives)

Price: £39

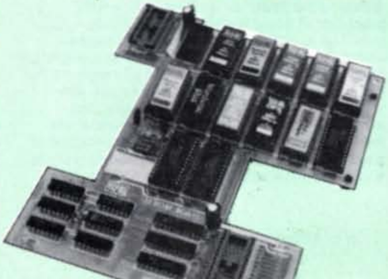
(Please write in for technical literature)

Continued→ → → → → → → → →

STAFF VACANCIES

Watford Electronics is the leading supplier in the Acorn computer field and has established itself in the PC compatible market with its Aries PC computers. In its eighteen year history, Watford has always kept itself at the forefront of the new technology. Due to our latest expansion, we require staff to man our BBC/Archimedes and PC Technical Departments. Applicants will be required to be familiar with BBC/Archimedes hardware and software, and PC staff will need to be familiar with PC computer hardware. Good rates of pay, excellent prospects. Subsidised company accomodation is available to single persons if required. Telephone Keith Archer or Richard Overfield for interview, or write to us enclosing your CV.

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:

- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £35
Battery Backup fitted **£39**
Battery Backup only **£3**
16K Sideways RAM **£8.50**
(carriage £3)

- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

Only: £8

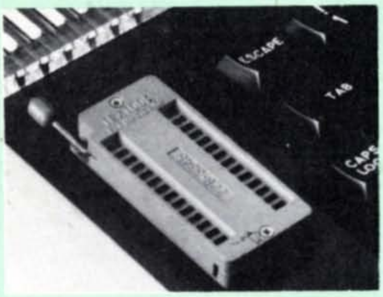
USER PORT SPLITTER UNIT

User PortSplitter
A
B

Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaneously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination

Excellent Value at **£22** (carr £2)

Sideways ROM ZIF Socket System



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for professionals and Hobbyists alike.)
- BBC, B+ and Master compatible.

ONLY **£18** (carr £3)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack for the BBC B.

● Complete System	**£11**
● Spare Cartridges	**£2.75**
● Spare Rack	**£1.65**

ROM Cartridges for the BBC Master

Will accept the new larger Piggy Back ROMs like: Interword, Interbase, Quest, Conquest, etc

Twin **£9**; Quad **£14**

16K Disc Ram Module

(16K Sideways RAM Module)

Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.

Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances)
- Compact construction
- No overheating or overloading problems.
- Free utilities disc supplied
- Can be used as a 16K PRINTER BUFFER.
- Ideal for profressional software development.
- Supplied with utilities software disc.

Only: **£29** (carr £2)

Optional Battery back-up fitted **£3**

ARIES CORNER

B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Cobal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved ★FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as th printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on you BBC micro – no flying leads to connect and no soldering. Provision of the onboard ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

- Recommended by Computer Concepts for use with their Inter series of ROMs.

Price: **£59** (carr. £3)

Aries B-12 Sideways ROM Board

The B-12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost

Price:	Aries B-12	**£36**
	Aries B-12C	**£5**

ARIES B-488 IEEE-488 INTERFACE UNIT

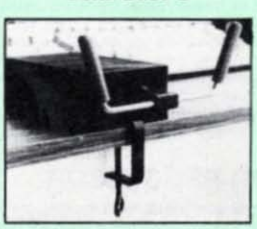
The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB or 'HP IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

£238 (Carr £3)

VOLTMACE JOYSTICKS

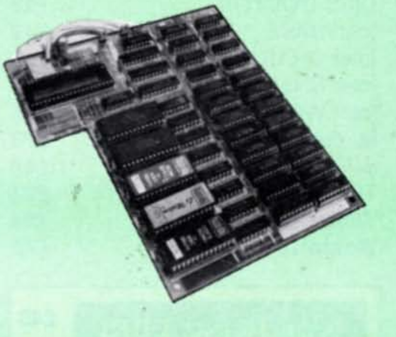
Delta 3B Single Joystick	**£10**
Delta 3B Twin Joysticks	**£15**
Delta 3C Joystick for Compact	**£10**
Delta 14B Single Joystick	**£11**
Delta 14B/1 Adaptor Module	**£12**
Transfer Software Disc-Tape	**£7**
Delta-Cat A mouse eliminator Joystick for the Archimedes	**£24**

Delta Base B



Analogue aircraft style yoke Joystick to run in the analogue port of the BBC B & Master 128	**£25**

ROM/RAM CARD



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 7 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Compatible with BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROMSPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

NTRODUCTORY PRICES:

● ROM/RAM card with 32k dynamic RAM	£48
● ROM/RAM card with 64k dynamic RAM	£65
● ROM/RAM card with a massive 128k dynamic RAM	£109

(carriage on ROM-RAM Card £3)

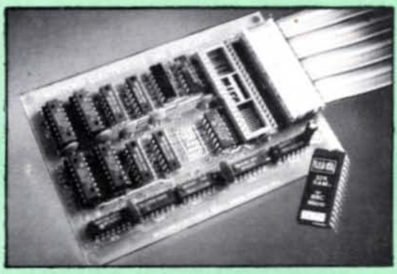
OPTIONAL EXTRAS:

● 16k plug-in Static RAM kit	£9
● 16k Dynamic RAM for Upgrade	£13
● Battery backup	£3
● Read and Write protect switches	**£2 each**
Complete ROM-RAM board All options installed	£115

P.S.

IS your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford, ROM/RAM Board and pay £5 less.

32K
SHADOW RAM-Printer Buffer
Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16k or even 20k, but a massive 32k of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.

- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.

- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24k of text in memory. This product is recommended as an ideal complement by Computer Concepts.

- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20k of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28k of program space.

- Use the FULL 32k or the bottom 12k of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS432 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138, 145,ADVAL etc). Please note only a 12k printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.

- Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

Only £59 (carr £3)
(Price includes a comprehensive manual and the ROM)

Acorn Speech Synthesizer package complete, for the BBC B Microcomputer

Special Offer £18

Watford Electronics are:

- Acorn Qualified Dealer & Econet Referral Centre
- ARIES PC Dealer/Distributor
- Cambridge Computer Dealer
- Epson Silver Centre
- EIZO Monitor Dealer
- Microvitec Appointed Dealer
- NEC Appointed Dealer
- Panasonic Premier Dealer
- Roland Plotter Official Dealer
- Star Printer Sub Distributor
- Taxan Monitor Distributor
- 3M Media Premier Distributor

BBC SOFTWARE'S
Popular Educational Software

● Maths with a Story 1 (Disc). 4 primary level maths programs	£11.25
● Maths with a Story 2 (Disc). 4 further maths programs.	£11.25
● Picture Craft (Disc) 6-14 age group. Pack consists of flexible geometrical design & colouring programs.	£17.00
● BONDING: Science (Disc) O-Level Chemistry program.	£20.00
● ELECTROMAGNETIC SPECTRUM (8 Discs) O-Level program.	£20.00
● ELECTRONICS IN ACTION (Disc) O-Level program.	£19.95
● NEWTON & THE SPACE SHUTTLE (Disc) O-Level program.	£20.00
● ECOLOGY (Disc) O-Level program.	£20.00
● POLYMERS (Disc) O-Level program.	£20.00
● Classification & Periodic Table O-Level. The suite is supplied with its own database of chemical elements which can be classified according to your own rule.	£20.00
● FOOD & POPULATION (Disc) O-Level program.	£20.00
● MICROTECHNOLOGY (Cassette) O-Level program.	£11.25
● DEUTSCH DIREKT! (Disc & Audio Cassette)	£19.95
● Modem Master (Disc)	£11.25
● ADVANCED TELETEXT SYSTEM	£8.65
● PERIOD TABLE SOFTWARE	£20.00
● Astronomy – Primary (Disc)	£12.00
● Computers at Work – Primary	£17.35
● Introducing Geography 11-17 years	£17.50
● Electric Fields 6-14 years	£11.25
● Black Queen Contract Bridge	£13.00
● Espana Viva – 3 Discs	£19.95

Educational Software

FUN SCHOOL 2 – Red:

Under 6 yrs – 8 programs on Discs, Shape Snap, Find the Mole, Teddy Count, Write a letter, Colour Train, Pick a Letter, Spell a Word & Teddy Bears Picnic. **£12.00**

FUN SCHOOL 2 – Green:

6-8 yrs – Eight programs on Disc, Number Train, Shopping, Maths Maze, Treasure Hunt, Bounce, Packing Caterpillar, 3 Number jump **£12.25**

FUN SCHOOL 2 – Blue:

Over 8 yrs – Eight programs on Disc, Build a Bridge, Passage of Guardians, Unicorn, Logic Doors, Souvenirs, Code Boxes, Mystery Machine & Escape. **£12.50**

Versatile **BEEB SPEECH SYNTHESISER** Unit

Beeb Speech Synthesiser

The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £3)

Continued→ → → → → → → → →

VIEW 3.0 ROM	**£45**
VIEW PROFESSIONAL	**£50**
VIEWSHEET (Acornsoft)	**£36**
VIEWSTORE	**£36**
VIEWSPELL with 80 track disc	**£25**
VIEWPLOT Disc (Please specify for Master 128 or Compact)	**£20**
VIEW-INDEX	**£12**
OVERVIEW packs 1 & 2	**£65**
HI-VIEW	**£38**

Watford's own Sophisticated VIEW PRINTER DRIVERS

Epson FX80 & Kaga KP (Disc)	**£8**
Juki & Brother HR15 (Disc)	**£8**

OFFICE MASTER

CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trial balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21** (Disc)

OFFICE MATE

- DATABASE
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Advanced Disc Toolkit	£28
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View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing at only a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, Panasonic KX-P1081/2, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built-in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redifinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute ★ command when printing.

Other features include a very powerful on-screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory-based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips.

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Wordwise plus **£40**

We are giving away absolutely **FREE,** the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

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- Text transfer options.
- Chapter marker.
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- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
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- Number/delete/renumber.
- Clear test-segment area.
- BBC B, B+ and Master compatible.

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(N.B. Word Aid requires a Disc interface in your Micro)

BOOK

The Complete Mouse User Guide to BBC Micro

This manual has been written to reveal the secrets of the mouse. It explains all the principles required by the hardware and associated software, and also example listings for inclusion into custom programs. The manual first details the basic principles of the mouse and a simple program which uses these principles. This information should be adequate for most applications. However, it is possible to improve the performance of the mouse by expanding on the principles already used in the software. This is again fully explained and an example program given.

It is possible to gain a full understanding of the mouse from this manual. For those not interested in exactly how the mouse functions, complete example programs are also included. These may be typed directly into the micro, without the need for any understanding of the hardware or software involved, enabling the mouse to be used for custom applications.

Price £5.95 (No VAT)

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"Why has no-one written a book like this before? It's long overdue".

If you own a BBC-B, BBC B+, Electron, Master 128, Master Compact or Archimedes then this book is for you. It shows you how to get the most from your computer, and how to make the computer work for you. Although some sections are machine specific, most of the information, programs, hints and good solid experience are for the whole range of BBC machines. The general style and level means that both beginner and expert will feel satisfied with the quality and quantity of the material.

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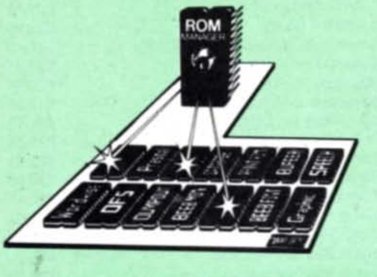

Take control of your Sideways ROMs with ROM Manager. This powerful utility ROM gives you power over your sideways ROMs . Disable whole ROMs, send commands directly to named ROMs and many other powerful facilities.
"Provides comprehensive management of all your installed ROMs". (BEEBUG November '84.)

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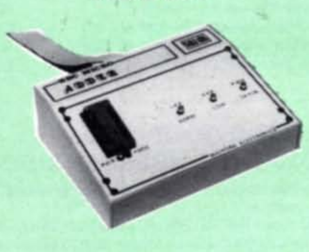
ADDER



The only low cost EPROM Programmer for the BBC Micro that will program both the standard 21V and the new 12V5, 27128 EPROMS.
The Adder unit connects to the User Port and draws its power from there too. The EPROM is mounted in a top quality ZIF socket. There are no switches or controls as Adder is entirely software controlled.
The Adder software provides sophisticated facilities for programming EPROMs from a RAM image produced by loading disc files. The software is menu driven and designed for ease of use.

Features:

- Two ultra fast programming algorithms or standard slow algorithm.
- Supports standard 21V programming and newer 12.5 volt EPROMs. (Software switched).
- The RAM image to be programmed can be built up in many ways. Sections of image can be loaded separately. Part programming. Read EPROM. Edit data in memory.
- Automatic processing to handle a list of files to program into the EPROM.
- Automatic disc buffering to allow programming of 32K 27256 devices from a 32K file without extra effort.
- Verification gives detailed error list and checksums are maintained. There is also a blank check facility.
- Works with all standard filing systems. Generates header code for RFS ROMs to allow Basic programs etc. to be stored in EPROM. More than one file per ROM permitted.
- Programs the following EPROMs: 2516, 2716, 2532, 2732, 2764, 27128, & 27256.

£65 (£5 Carr)

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EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs!
The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- **ERASER EB** – Standard version erases up to 16 chips. **£28** (carr £3)
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Fitted in place of your normal mains plug, this device protects your equipment (and data from corruption), against mains high voltage transient spikes/surges caused by lightening or thermostats switching.

Protection for only **£8.50**

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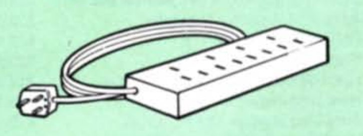

4 way top quality mains trailing sockets.
Supplied wired up with mains plug ready for use.
Can be screwed to floor or wall if required.
Very useful for tidying up all the mains leads from your peripherals.

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BBC to Disc Drives Ribbon Cable
Single **£4** Twin **£6**

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Watford POWER DUCK **£8**

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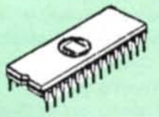

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ARIES PC-XT 88

ARIES PC AT 286

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- 16 Bit Intel 8088-2 or NEC V20 78108 microprocessor, running at 8MHz or 4.77MHz. (3 times faster than IBM PC/XT).
- 8087-2 maths co-processor, optional.
- 640K minimum expandable to 1024K on system board, extra 384K RAMDISK available.
- 360K Single Floppy (optional 2nd Floppy/3.5"/20MB Winny/T. Streamer).
- CLOCK on system board, gives non stop DATE & TIME.
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- 102 keys keyboard.
- RS232 with two ports
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- Mono graphics/parallel card (Herc compatible).
- Legal BIOS and built-in games card and clock.

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- Optional 80287 Maths co-processor
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- CLOCK on System board, gives non stop DATE & TIME.
- 8 expansion slots.
- 102 key keyboard
- Serial/Parallel Card.
- HDD/FDD Card
- Switchable Speed 8/12M Landmark test at 16MHz
- 200W power supply
- Mono graphics/parallel card (Herc. Compt.)
- Slide in metal case with function display.
- Legal BIOS and built-in games card and clock.

● FREE 12 month On-site Maintenance warranty (UK mainland) included in the price

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- **Archive Bulletin Board** keeps you in touch, on a day-to-day basis, with what is happening in the world of Archimedes. Part of it is open for public access, so give it a call on 0603–745932, scrolling, 8n1, up to 2400, 3 lines.
- **Archive Shareware / Careware discs.** We have a range of over 30 discs of public domain software from various sources. Many of the discs contain several quite substantial programs for as little as £3.50 per disc.
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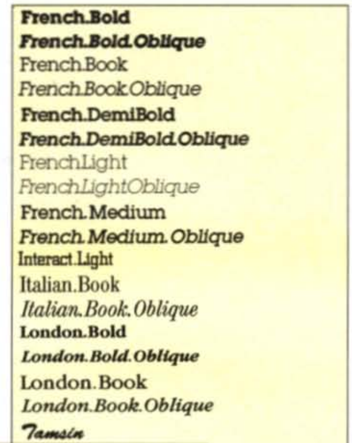
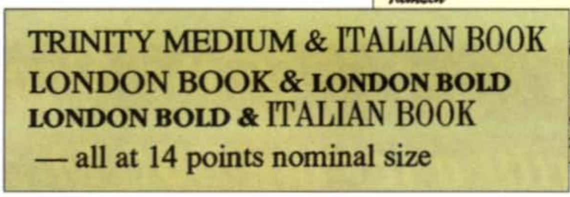
Fontasia for DTP

Bruce Goatly finds how to expand his typographical repertoire



French.Bold
French.Bold.Oblique
French.Book
French.Book.Oblique
French.DemiBold
French.DemiBold.Oblique
FrenchLight
FrenchLightOblique
French.Medium
French.Medium.Oblique
Interact.Light
Italian.Book
Italian.Book.Oblique
London.Bold
London.Bold.Oblique
London.Book
London.Book.Oblique
Tamsin
ue
Oblique
d
ld.Oblique

Figure I: Some of the EFF fonts



TRINITY MEDIUM & ITALIAN BOOK
LONDON BOOK & LONDON BOLD
LONDON BOLD & ITALIAN BOOK
— all at 14 points nominal size

Figure II: Different fonts – same point size

Product: Outline fonts
Price: £5.03 to £10.92 per font (depending on quantity)
Supplier: Electronic Font Foundry, Bridge House, 18 Brockenhurst Road, Ascot SL5 9DL
Tel: 0990 28698
Requirements: Archimedes series or BBC A3000

FOR more than just basic desktop publishing you need four things: A powerful computer, good software, a decent printer and plenty of fonts. The Archimedes is an eminently suitable machine because of its power and speed, and good software – like !Impression – has been around for some time. However, until recently its usefulness has been limited by a shortage of fonts for use with the new outline font manager.

Acorn and others have started to sell fonts separately but in nothing like the abundance of Electronic Font Foundry, who have galloped into the fray with 112 fonts, each costing rather less than the competition are asking for theirs. The selection ranges from the plain and staid to the fancy and frivolous.

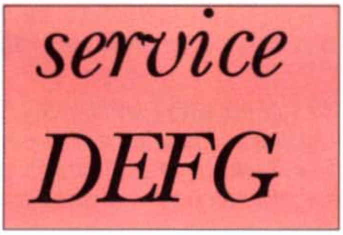
The packaging and presentation are, respectively, sturdy and professional. The fonts come with a complete catalogue and a no doubt intentionally intimidating licence notice warning you not to pass on copies. Installing the fonts is easy with the help of the manual provided – it gives particularly welcome advice on configuring Acorn's DTP package for the extras.

Each font contains all 208 Acorn-specified characters and a few more besides. As Figure I shows, the fonts are generally carefully designed, with well-formed letters. Being fussy I would say that some of the character spacing leaves a little to be desired – see Figure III – but by and large the overall appearance is pleasing. Catering for all character combinations is very tricky anyway.

Early releases of EFF fonts had problems in that they were over-sized, and from Figure II it seems that there are some residual inconsistencies. For example, London Bold is smaller than London Book at the same point size, and Italian Book is larger. Consistency of size is vital, especially within a type family because they will be used together. Fortunately it should be fairly easy for EFF to put right.

All the fonts, like their Acorn predecessors, can happily be printed on any graphic-type printer supported by the Risc OS printer drivers. Serious users, however, may want to output PostScript files and I understand that the fonts are being modified to make them PostScript compatible, which the review fonts weren't.

There are dangers inherent in having lots of fonts at hand – there's the uncontrolled desire to splash them about in a chaotic way in DTP work, with the sort of disastrous results shown in Figure IV. Another is that !Edit crashes if Risc OS has seen a !Fonts directory containing too many fonts, so if you want to use Edit on a hard disc you must move your !Fonts out of the root directory.

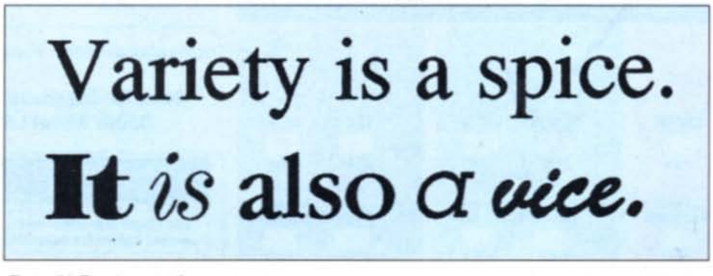


service
DEFG

Figure III: Letters bumping

Summing up

If you are using DTP you will probably have longed to have more than just the starter set of Trinity, Homerton and Corpus. EFF's fonts are the only feasible way at present of adding widely to your collection – short of designing them yourself, which is tedious in the extreme – so go for them. If you haven't yet plumped for DTP you can still use the fonts to enliven Draw files. Good luck to EFF, say I, and let's have some more.



Variety is a spice.
It is also a vice.

Figure IV: The dangers of excess

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MU7

Chessboard 2001

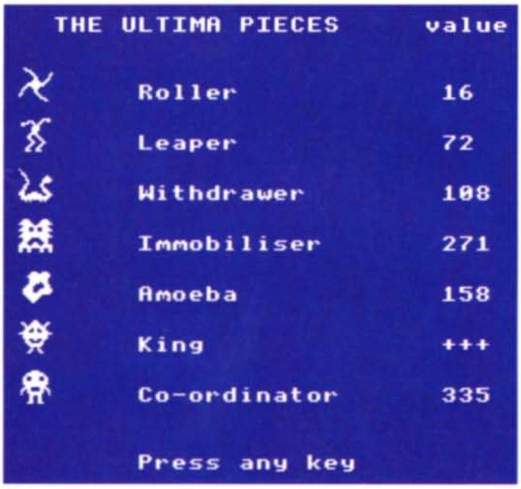
Chess takes a leap into the future in this strategy game by Terry Blunt

ULTIMA is a complex, two-player strategy game loosely based on Chess. The object is to take your opponent's king – there's no check or checkmate, to win you must carry out the threat.

Individual pieces move and take other pieces quite differently, too. All can move ➤

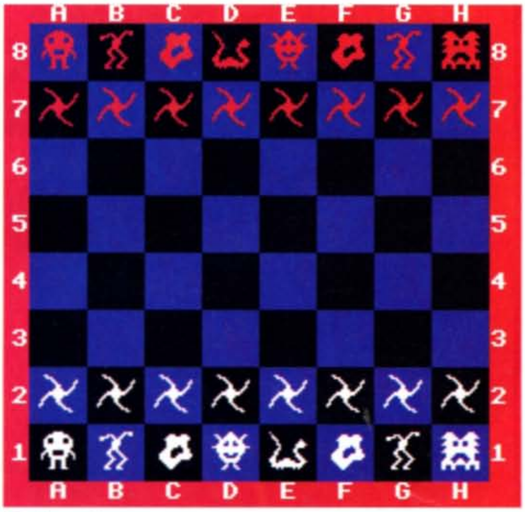
Each piece moves in a different way

King:	Moves on to the same square as its opponent to take.
Roller:	Takes by trapping an enemy piece against one of its own.
Leaper:	Steps over pieces to take them as in Draughts, but can take a long run up. More than one piece – in a single line – can be leapt as long there's only a single space between them.
Withdrawer:	Attacks by moving away– it must be next to an enemy piece before it moves.
Coordinator:	When this piece is moved it attacks enemy units that are located at the row/column intersections of the Coordinator and the King.
Amoeba:	This little horror changes its behaviour depending on the piece it is attacking. It rolls Rollers, leaps Leapers, coordinates with the King to kill Coordinators and so on.
Immobiliser:	Unlike all the others the Immobiliser can't take any enemy units. Instead if it moves up to an enemy or one of them comes in contact with it then it can no longer move until the Immobiliser moves away or is taken.

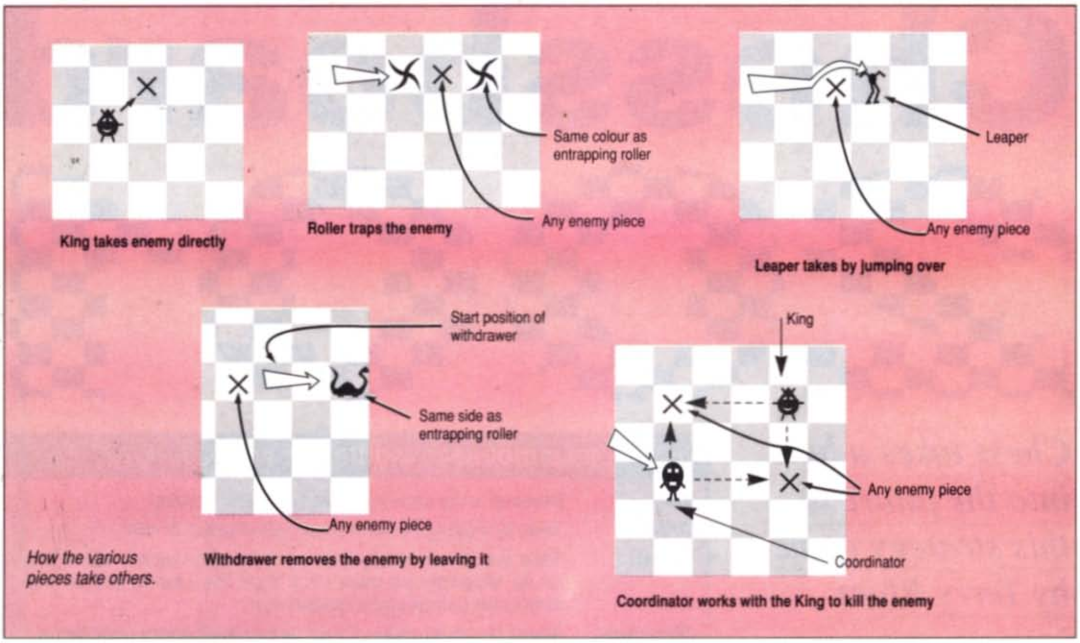


```
    THE ULTIMA PIECES          value

         Roller                 16

         Leaper                 72

         Withdrawer             108

         Immobiliser            271

         Amoeba                 158

         King                   +++

         Co-ordinator           335

         Press any key
```

The playing pieces



Starting position


Same colour as entrapping roller
Any enemy piece
Leaper
Any enemy piece
Start position of withdrawer
Same side as entrapping roller
Any enemy piece
King
Any enemy piece
Coordinator

King takes enemy directly

Roller traps the enemy

Leaper takes by jumping over

Withdrawer removes the enemy by leaving it

Coordinator works with the King to kill the enemy

How the various pieces take others.

➤

as far as required in a straight line except Rollers and the King. A Roller is similar to Chess's Rook or Castle and cannot move diagonally, while the King can only travel one square at a time, although in any direction.

The program is thoroughly error-trapped and will prevent illegal moves. The figure above shows the main moves, and screen shots on the previous page the starting positions.

Enter the listing and ensure you're made no typing errors using the checksums. It's very important to make sure that you save the program before you run it as, due to memory limitations, it shortens and relocates itself after the instructions have been displayed. To exit cleanly from the game once it is under way press Shift/Escape. Be warned that this is the shortened game and you shouldn't attempt to save it – although you can re-run.

● *Although you'll have to find a friend to play against we think you'll find this a challenging and exciting strategy game.*

```
   10 GOTO2600
   20 REM  Ultima
   30 REM  by Terry Blunt
   40 REM  (c) The Micro User
   50 :
   60 MODE1
   70 PROCinit
   80 ONERROR PROCaban
   90 REPEAT
  100 REPEAT
  110 PROCboard
  120 REPEAT
  130 IFL N=M:M=(M+1)MOD2
  140 PROCmove
  150 UNTILFNget(kX?N,kY?N)=80
  160 PROCend
  170 UNTILFALSE
  180 :
  190 DEFPROCaban
  200 IFERR=17 ANDINKEY TRUE END
  210 R=0:W=0
  220 VDU23;10,32;0;0;0;
  230 IFQ% SOUND1,-15,50,10
  240 PRINTTAB(2,30)"Game abandoned.  Ca
lculating points."
  250 FORX=1 TO8
  260 FORY=1 TO8
  270 A=FNget(X,Y):B=(A MOD40)DIV4
  280 RESTORE2590
  290 FORI%=0 TOB
  300 READ C
  310 NEXT
  320 IFA<40 R=R+C ELSEW=W+C
  330 NEXT,
  340 IFR>W kX?1=0:kY?1=0 ELSEIFR<W ?kX=
0:?kY=0
  350 PROCend
  360 ENDPROC
  370 :
  380 DEFPROCinit
  390 X%=176:Y%=944
  400 kX=R%+100:kY=R%+104
  410 VDU23;10,32;0;0;0;
  420 VDU19,1,4;0;19,2,1;0;
  430 COLOUR130:CLS
  440 ENDPROC
  450 :
  460 DEFPROCboard
  470 PROCclear
  480 FORY=6 TO29 STEP3
  490 FORX=8 TO31 STEP3
  500 VDU28,X,Y,X+2,Y-2
  510 COLOUR129-(X+Y)MOD2:CLS
  520 NEXT,
  530 VDU26:COLOUR130:COLOUR3
  540 FORI%=3 TO24 STEP3
  550 PRINTTAB(7,I%+2);9-I% DIV3 TAB(32,
I%+2);9-I% DIV3 TAB(I%+6,3)CHR$(I% DIV3+
64)TAB(I%+6,28)CHR$(I% DIV3+64)
  560 NEXT
  570 FORX=0 TO9
  580 FORY=0 TO9
  590 PROCput(X,Y,80)
  600 NEXT,
  610 FORX=1 TO8
  620 A=X?&9CF:B=X?&9D7
  630 PROCput(X,1,A):PROCput(X,2,4):PROC
put(X,7,44):PROCput(X,8,B)
  640 PROCprint(FALSE,A,0,X,1):PROCprint
(FALSE,4,0,X,2):PROCprint(FALSE,4,1,X,7)
:PROCprint(FALSE,B,1,X,8)
  650 NEXT
  660 PRINTTAB(1,14)"Move" TAB(4,30)"'ES
CAPE' to abandon a stalemate"
  670 PROCbeep(200)
  680 kX?0=5:kX?1=4:kY?0=1:kY?1=8:L=FALS
E:M=1:N=0
  690 ENDPROC
  700 :
  710 DEFPROCmove
  720 IFM=0 PRINTTAB(15,1)" Red move " E
LSEPRINTTAB(15,1)"White move"
  730 L=TRUE
  740 PROCin(0)
```

➤

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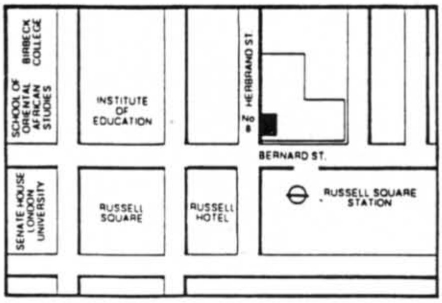

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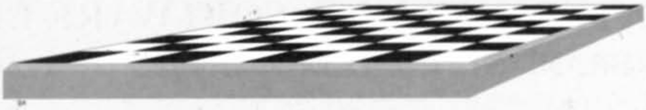

➤

```
 750 V=X:W=Y
 760 PROCin(2)
 770 PRINTTAB(1,12)"Last"
 780 IFFNget(X,Y)<80 L=FALSE
 790 IFNOT L PROCno:ENDPROC
 800 C=FNget(V,W)
 810 B=C MOD40
 820 D=FNget(X,Y)
 830 FORI%=0 TO7
 840 E=I%?&9C0-1:F=I%?&9C8-1
 850 IFABS(X-V)<>ABS(Y-W) ANDX-V<>0 AND
Y-W<>0 L=FALSE
 860 IFFNget(V+E,W+F)=16+N*40 L=FALSE
 870 IFB=16 ANDFNget(V+E,W+F)=20+N*40 L
=FALSE
 880 NEXT
 890 IFC DIV40<>M L=FALSE
 900 IFNOT L PROCno:ENDPROC
 910 IFB<>8 ANDB<>20 ANDB<>24 PROCline
 920 IFNOT L PROCno:ENDPROC
 930 IFB=4 PROCroll
 940 IFB=28 PROCcoord
 950 IFB=8 PROCleap
 960 IFB=20 PROCamaeb
 970 IFB=12 PROCwith
 980 IFB=24 PROCking
 990 IFNOT L PROCno:ENDPROC
1000 PROCbeep(200)
1010 PROCput(V,W,80):PROCput(X,Y,C)
1020 PROCprint(FALSE,C,M,V,W):PROCprint
(FALSE,C,M,X,Y)
1030 ENDPROC
1040 :
1050 DEFPROCline
1060 E=SGN(X-V):F=SGN(Y-W):G=V:H=W
1070 REPEAT
1080 G=G+E:H=H+F
1090 IFFNget(G,H)<80 L=FALSE
1100 UNTILG=X ANDH=Y
1110 ENDPROC
1120 :
1130 DEFPROCin(B)
1140 VDU23;10,64;0;0;0;
1150 X=0:Y=0
1160 FORI%=1 TO4 STEP3
1170 VDU31,I%,16+B
1180 REPEAT
1190 K=GET
1200 UNTIL(K>48 ANDK<57) OR(K>64 ANDK<7
3)
1210 IFI%=1 ANDB=0 PROCclear
1220 IFK<57 ANDY=0 Y=57-K ELSEIFK>64 AN
DX=0 X=K-64
1230 VDU31,I%,16+B,K
1240 NEXT
1250 IFX<1 ORX>8 ORY<1 ORY>8 L=FALSE
1260 VDU23;10,32;0;0;0;
1270 ENDPROC
1280 :
1290 DEFPROCroll
1300 IFABS(V-X)=ABS(W-Y) L=FALSE ELSEPR
OCrolla
1310 ENDPROC
1320 :
1330 DEFPROCrolla
1340 FORI%=0 TO3
1350 E=I%?&9C0-1:F=I%?&9C8-1
1360 IFB=20 ANDFNget(X+E,Y+F)<>4+N*40 O
RX+E*2<0 ORX+E*2>9 ORY+F*2<0 ORY+F*2>9 G
OT01380
1370 IFFNget(X+E,Y+F)DIV40=N ANDFNget(X
+E*2,Y+F*2)DIV40=M PROCprint(TRUE,FNget(
X+E,Y+F),N,X+E,Y+F):PROCput(X+E,Y+F,80)
1380 NEXT
1390 ENDPROC
1400 :
1410 DEFPROCleap
1420 E=SGN(X-V):F=SGN(Y-W)
1430 G=V:H=W
1440 REPEAT
1450 G=G+E:H=H+F
1460 UNTILG=X ANDH=Y ORFNget(G,H)<80
1470 IFFNget(G,H)DIV40=M L=FALSE:GOTO15
70
1480 IFG=X ANDH=Y GOTO1570
1490 g=G:h=H
1500 REPEAT
1510 IFFNget(G,H)DIV40<>N L=FALSE
1520 G=G+E:H=H+F
1530 IFFNget(G,H)<80 L=FALSE
1540 G=G+E:H=H+F
1550 UNTILG=X+E ANDH=Y+F ORL=FALSE
1560 IFL PROCstep
```

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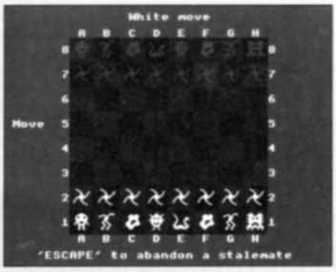
```
1570 ENDPROC
1580 :
1590 DEFPROCleapa
1600 E=SGN(X-V):F=SGN(Y-W)
1610 G=V+E:H=W+F
1620 IFFNget(G,H)=8+N*40 GOTO1690
1630 REPEAT
1640 IFFNget(G,H)<80 ANDFNget(G,H)<>8+N
*40 L=FALSE
1650 G=G+E:H=H+F
1660 UNTILG=X ANDH=Y ORL=FALSE
1670 IFNOT L ENDPROC
1680 G=X-E:H=Y-F
1690 PROCprint(TRUE,FNget(G,H),N,G,H):P
ROCput(X-E,Y-F,80)
1700 ENDPROC
1710 :
1720 DEFPROCstep
1730 REPEAT
1740 IFFNget(g,h)<80 PROCprint(TRUE,FNg
et(g,h),N,g,h):PROCput(g,h,80)
1750 g=g+E:h=h+F
1760 UNTILg=X ANDh=Y
1770 ENDPROC
1780 :
1790 DEFPROCwith
1800 E=V+SGN(V-X):F=W+SGN(W-Y)
1810 IFFNget(E,F)DIV40=N PROCprint(TRUE
,FNget(E,F),N,E,F):PROCput(E,F,80)
1820 ENDPROC
1830 :
1840 DEFPROCcoord
1850 E=FNget(X,kY?M):F=FNget(kX?M,Y)
1860 IFE DIV40=N PROCprint(TRUE,E,N,X,k
Y?M):PROCput(X,kY?M,80)
1870 IFF DIV40=N PROCprint(TRUE,F,N,kX?
M,Y):PROCput(kX?M,Y,80)
1880 ENDPROC
1890 :
1900 DEFPROCamaeb
1910 IFD=24+N*40 PROCking:ENDPROC ELSEI
FD<80 L=FALSE
1920 IFFNget(X,Y)=80 ANDFNget(SGN(V-X)+
X,SGN(W-Y)+Y)=8+N*40 PROCleapa ELSEPROCl
ine
1930 IFNOT L ENDPROC
1940 IFFNget(SGN(V-X)+V,SGN(W-Y)+W)=12+
N*40 PROCwith
1950 PROCrolla
1960 E=FNget(X,kY?M):F=FNget(kX?M,Y)
1970 IFE=28+N*40 PROCprint(TRUE,E,N,X,k
Y?M):PROCput(X,kY?M,80)
1980 IFF=28+N*40 PROCprint(TRUE,F,N,kX?
M,Y):PROCput(kX?M,Y,80)
1990 ENDPROC
2000 :
2010 DEFPROCking
2020 IFC DIV40=D DIV40 L=FALSE
2030 IFABS(X-V)=0 ANDABS(Y-W)=0 ORABS(X
-V)>1 ORABS(Y-W)>1 L=FALSE
2040 IFNOT L ENDPROC
2050 IFD<80 PROCprint(TRUE,D,N,X,Y)
2060 IFD=24+N*40 kX?N=0:kY?N=0:PROCput(
X,Y,80) ELSEPROCput(X,Y,80):kX?M=X:kY?M=
Y
2070 ENDPROC
2080 :
2090 DEFPROCno
2100 IFQ% SOUND1,-15,50,10
2110 PRINTTAB(9,30)"You can't move ther
e !";
2120 ENDPROC
2130 :
2140 DEFPROCprint(T,C,M,X,Y)
2150 I%=&9F0+(C MOD40)*4
2160 G=(Y MOD2)EOR(X MOD2)
2170 IFG A=2+M ELSEA=3-M
2180 C=C MOD40+220:X=X*96:Y=Y*96
2190 GCOL3,A
2200 MOVE X+X%,Y%-Y+32
2210 VDU5,C,C+1,10,8,8,C+2,C+3,4,31,10,
30
2220 IFNOT T ENDPROC
2230 IFM=0 PRINT"White "; ELSEPRINT" Re
d ";
2240 PRINT"takes " $I% SPC7;
2250 PROCbeep(100):PROCwait(100)
2260 ENDPROC
2270 :
2280 DEFPROCend
2290 PRINTTAB(11,1);
2300 IFFNget(kX?1,kY?1)=80 PRINT" *** R
ED  WIN ***" ELSEIFFNget(?kX,?kY)=80 PRI
NT"*** WHITE  WIN ***" ELSEPRINT"*** GAM
```



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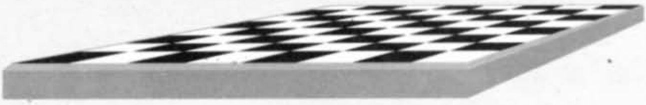
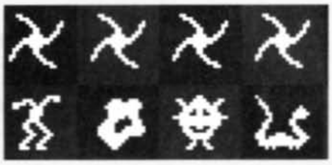


```
E DRAWN ***"
 2310 FORI%=0 TO4
 2320 PROCwait(30):PROCbeep(180)
 2330 NEXT
 2340 PRINTTAB(2,30)SPC6 "Press any key
to restart" SPC6
 2350 IF GET
 2360 ENDPROC
 2370 :
 2380 DEFPROCput(X,Y,Z)
 2390 R%?(X+Y*10)=Z
 2400 ENDPROC
 2410 :
 2420 DEFFNget(X,Y)
 2430 =R%?(X+Y*10)
 2440 :
 2450 DEFPROCbeep(P)
 2460 IFQ% SOUND 1,1,P,1
 2470 ENDPROC
 2480 :
 2490 DEFPROCwait(T)
 2500 TIME=0
 2510 REPEAT:IFINKEY0
 2520 UNTILTIME>T
 2530 ENDPROC
 2540 :
 2550 DEFPROCclear
 2560 PRINTTAB(2,1)SPC36 TAB(1,12)SPC4 T
AB(1,16)SPC4 TAB(1,18)SPC4 TAB(2,30)SPC3
6
 2570 ENDPROC
 2580 :
 2590 DATA 0,16,72,108,271,158,0,335
 2600 ONERROR:
 2610 MODE7:VDU23;8202;0;0;0;:RESTORE369
0
 2620 PROCtitle(3)
 2630 PRINTTAB(1,7)CHR$145 CHR$183 STRIN
G$(33,CHR$163) CHR$235
 2640 FORI%=8 TO10
 2650 PRINTTAB(1,I%)CHR$145 CHR$181 CHR$
149 SPC31 CHR$145 CHR$234
 2660 NEXT
 2670 PRINTTAB(1,11)CHR$145 CHR$245 STRI
NG$(33,CHR$240) CHR$250
 2680 PRINTTAB(6,8)"T H E   B O A R D
G A M E"
 2690 PRINTTAB(5,10)"F O R   T W O   P L
 A Y E R S"
 2700 FORI%=13 TO14
 2710 PRINTTAB(7,I%)CHR$141 CHR$134"W R
I T T E N"SPC5"B Y"
 2720 NEXT
 2730 PROCtitle(16)
 2740 VDU23,224,48,28,6,3,1,1,3,15
 2750 VDU23,225,0,0,1,3,130,134,204,248
 2760 VDU23,226,31,51,97,65,192,128,0,0
 2770 VDU23,227,240,192,128,128,192,96,5
6,12
 2780 VDU23,228,0,14,123,97,3,3,3,7
 2790 VDU23,229,30,54,96,192,192,192,128
,128
 2800 VDU23,230,12,12,6,3,6,12,24,28
 2810 VDU23,231,192,96,48,24,48,96,192,2
24
 2820 VDU23,232,128,64,96,48,16,24,8,24
 2830 VDU23,233,0,0,0,4,14,31,30,48
 2840 VDU23,234,48,48,96,227,239,127,127
,20
 2850 VDU23,235,48,24,28,142,231,254,252
,40
 2860 VDU23,236,56,124,254,63,121,249,63
,127
 2870 VDU23,237,28,62,127,252,158,159,25
2,254
 2880 VDU23,238,255,60,56,113,251,255,20
4,204
 2890 VDU23,239,255,60,28,140,223,255,51
,51
 2900 VDU23,240,0,3,7,15,7,7,7,15
 2910 VDU23,241,0,156,254,254,252,252,22
```



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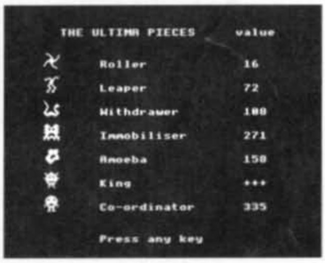
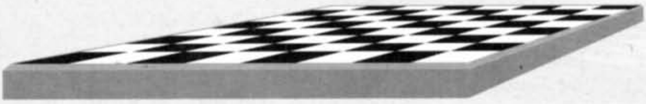
```
0,14
 2920 VDU23,242,30,62,62,63,31,15,7,3
 2930 VDU23,243,14,63,127,254,224,192,12
8,0
 2940 VDU23,244,1,99,55,31,29,57,255,63
 2950 VDU23,245,128,198,236,248,184,156,
255,252
 2960 VDU23,246,63,25,28,15,7,2,6,12
 2970 VDU23,247,252,152,48,240,224,64,96
,48
 2980 VDU23,248,3,15,31,51,51,63,63,31
 2990 VDU23,249,192,240,248,204,204,252,
252,248
 3000 VDU23,250,60,108,79,71,6,6,6,14
 3010 VDU23,251,60,54,242,226,96,96,96,1
12
 3020 ENVELOPE 1,1,0,0,0,1,0,0,126,0,0,-
1,126,0
 3030 ONERROR:
 3040 RESTORE3710
 3050 FORI%=&A00 TO&A60 STEP16
 3060 READ $I%
 3070 NEXT
 3080 R%=I%:Q%=TRUE:A$="Press any key"
 3090 FORI%=&9C0 TO&9DF
 3100 READ ?I%
 3110 NEXT
 3120 PROCwait(100):PRINTTAB(7,21)CHR$13
4 "DO YOU WANT SOUND CUES ?"TAB(13,23)CH
R$134"( Y / N )";
 3130 Q%=FNkey
 3140 PROCwait(100):PRINTTAB(7,21)CHR$13
3 "DO YOU WANT DIRECTIONS ?"
 3150 IFNOTFNkey GOTO3400
 3160 ONERROR:
 3170 VDU28,0,24,39,7,12
 3180 FORI%=0 TO16
 3190 PRINTCHR$130
 3200 NEXT
 3210 VDU28,1,24,38,7,12
 3220 PRINTSPC4 "The object of this game
 is to takeyour opponents king. There is
 no Checkunlike chess."''SPC5 "With the
exception of the Rollersand the King,  m
ovement of the  piecesis in the style of
 a chess Queen."
 3230 PRINT'SPC3 "The Rollers move only
verticaly andhorizontaly, taking pieces
by trappingthem against any other piece
belongingto the same player as the Rolle
r."''SPC4 "The King moves and takes piec
es asa chess King does."
 3240 PROChold
 3250 PRINTSPC3 "The Leapers can step ov
er pieces totake them  and must  have a
clear pathto the piece being taken. Howe
ver theycan take a line of pieces provid
ed onegap only exists between each of th
em."
 3260 PRINT'SPC3 "The Withdrawer has to
move directlyaway from a piece to take i
t."''SPC4 "When the Co-ordinator is move
d anyof your opponents pieces placed on
thecolumn _ row intersections of the Kin
gand Co-ordinator are taken."
 3270 PROChold
 3280 PRINT'SPC5 "Amoebas  change their
behavior tomatch the piece they are deal
ing with.They roll Rollers, leap Leapers
 etc."''SPC5 "The Immobiliser is the onl
y pieceunable to take  others.";
 3290 PRINT"  Any opponentspiece that co
mes into  contact with itis held  until
the immobilser is movedor taken." TAB(3,
12)CHR$131 "'ESCAPE'" CHR$130 " if you w
ant to read thisinformation again."
 3300 PROChold
 3310 ONERROR GOTO3400
 3320 MODE4:VDU23;8202;0;0;0;19,0,4;0;:R
ESTORE3760
 3330 PRINTTAB(7,3)"THE ULTIMA PIECES" T
AB(22)"value"
 3340 FORI%=8 TO32 STEP4
 3350 READ B$
 3360 A%=I%+216
 3370 PRINTTAB(5,I%*0.75)CHR$A% CHR$(A%+
1)TAB(5,I%*0.75+1)CHR$(A%+2)CHR$(A%+3)TA
B(9)$(&9E0+I%*4)TAB(27)B$
 3380 NEXT
 3390 PROCwait(100):PRINTTAB(12,29)A$:IF
GET
 3400 !(PAGE+4)=&F4:RESTORE2600
 3410 I%=2+!&1C AND&FFFF
 3420 REPEAT:I%=I%-1
 3430 UNTIL I%?-1=13
```



```
THE ULTIMA PIECES     value

      Roller          16
      Leaper          72
      Withdrawer      108
      Immobiliser     271
      Amoeba          158
      King            +++
      Co-ordinator    335

      Press any key
```



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```
 3440 IFPAGE>&E00 PROCdown
 3450 ?I%=&FF:!&12=I%+1:RUN
 3460 :
 3470 DEFPROCdown:*TAPE
 3480 PROCbeep(200):PRINTCHR$11SPC14"PLE
ASE WAIT"SPC80;
 3490 FORJ%=0 TOI%-PAGE STEP4:J%!&E00=J%
!PAGE:NEXT
 3500 I%=I%+&E00-PAGE:PAGE=&E00
 3510 ENDPROC
 3520 :
 3530 DEFPROCtitle(N%)
 3540 READS$&C00:PRINTTAB(0,N%);
 3550 FORI%=0 TO223 STEP2
 3560 VDUEVAL("&"+CHR$(I%?&C00)+CHR$(I%?
&C01))
 3570 NEXT
 3580 ENDPROC
 3590 :
 3600 DEFPROChold:PROCwait(100):PROCbeep
(200)
 3610 PRINTTAB(12,16)CHR$131 A$:IFGETCLS
 3620 ENDPROC
 3630 :
 3640 DEFFNkey:PROCbeep(200)
 3650 REPEAT:G%=GET AND95
 3660 UNTILG%=78 ORG%=89
 3670 =G%=89
 3680 :
 3690 DATA 939A20FF20B5202020FF202020202
0A3FFA1202020EBB720202020FDB8B5202020FEA
3B40D0A939A20FF20B5202020FF20202020202020F
F20202020EAB520202020FF20B5202020FFACB50
D0A939A20EFF0A5202020FFF0B020202020FF202
02020FAF520202020FF20B5202020FF20B5
 3700 DATA 929A20A3FFA1FFA3A1FFA3B4FFA3B
4FF20B5202020FFA3B4FF2020FF20B5FFB0B5A3F
FA10D0A929A2020FF20FFAC20FFACB1FFACB1A2A
CB5202020FFACB1FF2020FF20B5FFEDB520FF200
D0A929A2020FF20FFF0B0FF20B5FF20B5E0F0A52
02020FFF0A5FFF0B0EFF0A5FFA2B520FF20
 3710 DATA Roller,Leaper,Withdrawer,Immo
biliser,Amoeba,King,Co-ordinator
 3720 DATA 2,1,0,1,2,0,0,2
 3730 DATA 1,2,1,0,2,2,0,0
 3740 DATA 28,8,20,12,24,20,8,16
 3750 DATA 68,48,60,64,52,60,48,56
 3760 DATA 16,72,108,271,158,+++,335
```

Get it right ✓

```
  10 = 15E6 6
  20 =    0 6
  30 =    0 6
  40 =    0 6
  50 = 9719 D
  60 = EA3A 9
  70 = DEBB 7
  80 = 1DB5 6
  90 = BFBA B
 100 = BFBA D
 110 = 24DD B
 120 = BFBA 2
 130 = 5335 D
 140 = 3227 9
 150 = 1FC8 E
 160 =  6B9 4
 170 = E014 9
 180 = 9719 4
 190 = FE3C 2
 200 =  C34 0
 210 = 3DD3 C
 220 = 210A 3
 230 = F4D7 2
 240 =  DEE 8
 250 = 6C47 3
 260 = 29E7 4
 270 = 78C5 B
 280 = FA0C 4
 290 = 40FC F
 300 = C443 B
 310 = 2C83 2
 320 = 4198 9
 330 = 8300 1
 340 = 7F8F B
 350 =  6B9 D
 360 = ED0F 9
 370 = 9719 A
 380 = 344C 1
 390 = FA13 9
 400 = B507 8
 410 = 210A 2
 420 = DC96 6
 430 = 1679 8
 440 = ED0F 8
 450 = 9719 F
 460 = 8FB9 B
 470 = ED47 C
 480 = AD77 8
 490 = 73B1 0
 500 = 8939 F
 510 = CF91 D
 520 = 8300 A
 530 = ED2C 8
 540 = D983 2
 550 = D611 0
 560 = 2C83 F
 570 =  AD2 C
 580 = 4F72 0
 590 = 8227 9
 600 = 8300 3
 610 = 6C47 4
 620 = 6049 E
 630 = D149 A
 640 = B2F6 6
 650 = 2C83 9
 660 = 53F1 D
 670 = 2F39 3
 680 = E9CB 0
 690 = ED0F B
 700 = 9719 6
 710 = D8D0 F
 720 = 4D25 6
 730 = 2DF7 6
 740 = CF6D 9
 750 = 1A6B F
 760 = A90F C
 770 =  6B8 6
 780 = EB0B A
 790 = EF36 F
 800 = D7F1 6
 810 = 893C 8
 820 = 7F19 A
 830 = 6ECE 8
 840 = AE7B A
 850 = 4242 6
 860 = B8B1 3
 870 = BEBE F
 880 = 2C83 5
 890 = E2EC F
 900 = EF36 1
 910 = 2A73 F
 920 = EF36 F
 930 = 1763 E
 940 = 41D4 8
 950 = 9ED5 6
 960 = 17C6 C
 970 =  134 B
 980 = 21A6 C
 990 = EF36 D
1000 = 2F39 3
1010 = 4F0D 9
1020 = 5347 3
1030 = ED0F B
1040 = 9719 A
1050 = 961E A
1060 = DE1F E
1070 = BFBA 7
1080 = 4680 1
1090 = 8DD8 6
1100 = 6C56 B
1110 = ED0F D
1120 = 9719 2
1130 =  A32 F
1140 = D60D 1
1150 = D59C 0
1160 = 844B D
1170 = 19E8 1
1180 = BFBA E
1190 = 7BDA F
1200 = F2F6 8
1210 = 379D 0
1220 = 6B16 3
1230 = 7FE9 3
1240 = 2C83 7
1250 = D721 4
1260 = 210A A
1270 = ED0F 3
1280 = 9719 B
1290 = 6A08 2
1300 = 8C59 D
1310 = ED0F C
1320 = 9719 5
1330 = B96B E
1340 = 2E4A B
1350 = AE7B 5
1360 = 3552 C
1370 = 2AE0 2
1380 = 2C83 9
1390 = ED0F 6
1400 = 9719 4
1410 = B1D5 1
1420 = 943B F
1430 = D445 2
1440 = BFBA E
1450 = 4680 D
1460 = BCC1 7
1470 = 5C0B E
1480 = A6F3 D
1490 = 71A0 E
1500 = BFBA C
1510 = 11F1 7
1520 = 4680 7
1530 = 8DD8 2
1540 = 4680 E
1550 = BA9F E
1560 = 2152 A
1570 = ED0F 5
1580 = 9719 F
1590 = 1E7D 8
1600 = 943B C
1610 = 910F 7
1620 = AC92 7
1630 = BFBA 5
1640 = 867A D
1650 = 4680 1
1660 = 41A4 D
1670 = 565D 5
1680 = D314 E
1690 = 769C 4
1700 = ED0F 6
1710 = 9719 9
1720 = C60B 5
1730 = BFBA 1
1740 =  C2B A
1750 = C574 F
1760 = 91F8 6
1770 = ED0F B
1780 = 9719 A
1790 = AEB3 0
1800 = 8708 2
1810 = 9DFF 8
1820 = ED0F 9
1830 = 9719 4
1840 = 3EE9 D
1850 = E3D0 D
1860 = D0C1 7
1870 = 325E 2
1880 = ED0F A
1890 = 9719 7
1900 = 7621 A
1910 = DFA5 3
1920 = 99CF D
1930 = 565D C
1940 = 6A2F D
1950 = 120F D
1960 = E3D0 7
1970 = 4E95 6
1980 = 8D14 1
1990 = ED0F 7
2000 = 9719 8
2010 = E771 A
2020 = A7F6 8
2030 = 437D 1
2040 = 565D 2
2050 = B7C3 7
2060 = B580 5
2070 = ED0F 1
2080 = 9719 6
2090 = A9DB A
2100 = F4D7 E
2110 = 58F6 4
2120 = ED0F 3
2130 = 9719 8
2140 = 63C4 5
2150 = A240 6
2160 = 38C4 B
2170 = 355D F
2180 = 8645 9
2190 = 24E8 D
2200 = 6506 1
2210 = 6A3A D
2220 = BC9F 4
2230 = F0D1 5
2240 = D2AA B
2250 = 7CF3 3
2260 = ED0F 3
2270 = 9719 C
2280 = 1021 6
2290 = 2FD5 E
2300 = C39F 5
2310 = 5EAD 5
2320 = 2FBD 6
2330 = 2C83 5
2340 = B037 5
2350 = C608 5
2360 = ED0F F
2370 = 9719 0
2380 = 5902 6
2390 = 41A8 D
2400 = ED0F 7
2410 = 9719 2
2420 = C5A8 4
2430 = 204B 0
2440 = 9719 E
2450 =  C00 D
2460 = 95ED 8
2470 = ED0F 3
2480 = 9719 7
2490 = C963 B
2500 = 173E 8
2510 = FC69 E
2520 = D529 7
2530 = ED0F B
2540 = 9719 9
2550 = 4623 E
2560 = 8C56 1
2570 = ED0F 1
2580 = 9719 F
2590 = B935 3
2600 = C844 C
2610 = 6249 4
2620 =  B0E 8
2630 = 8BBB F
2640 = DDB0 7
2650 = 7226 D
2660 = 2C83 F
2670 = F49E E
2680 = 4628 A
2690 = 9FDD C
2700 = ABCB B
2710 = EC88 5
2720 = 2C83 6
2730 = 770D 1
2740 = 6793 9
2750 = 3D8A 9
2760 = 25E1 4
2770 = 54DF 0
2780 = 1BC9 1
2790 = B3A7 C
2800 = E4DE 4
2810 = 5B5E 4
2820 = 2BDF 8
2830 = 6268 4
2840 = 15F4 E
2850 = 4CD6 4
2860 =  5B5 9
2870 = 87F5 9
2880 = F602 C
2890 = 3251 3
2900 = ECFF F
2910 = F09B 5
2920 = 161E E
2930 = 9B7F B
2940 = 5664 1
2950 = 4928 2
2960 = 7461 9
2970 =   44 6
2980 = 806C A
2990 = 363D 7
3000 = 155C 0
3010 = 693A 1
3020 = F6CF 7
3030 = C844 4
3040 = FF0D 3
3050 = 286B 4
3060 = 7F5F 9
3070 = 2C83 0
3080 = 9A75 9
3090 = 6C34 E
3100 = CCCD C
3110 = 2C83 A
3120 = 9509 B
3130 = 5917 D
3140 = 6F0C 1
3150 = 32A6 5
3160 = C844 1
3170 =  C94 8
3180 = BF5B 6
3190 = C950 9
3200 = 2C83 D
3210 = 4A41 5
3220 = E211 1
3230 = CD3F 7
3240 = 72FB 1
3250 = B49E 2
3260 = 8ED8 0
3270 = 72FB 0
3280 = 68E1 3
3290 = 3306 B
3300 = 72FB 0
3310 = 29FA C
3320 = 9CBC 4
3330 =  E2C E
3340 = F203 6
3350 = 8D1F 3
3360 = DF1F E
3370 = 54C6 E
3380 = 2C83 5
3390 = B312 2
3400 = 62D3 B
3410 = 654B 4
3420 = BFAD F
3430 = 8286 D
3440 = 3228 B
3450 = D24C 4
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3490 = 302B 2
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3760 = 9B91 7
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Make a date and keep it

£10 *Prize letter*

MUCH is often made of the ability of View 3.0 on the Master to enter the current date into letters or documents using D in association with a margin command such as RJ.

The problem with this approach is that only the D, rather than the actual date, is retained in the document. So there is no record of when the document was actually produced, and if a further copy is printed at a later date it will show the new date rather than being a true copy of the document with its original date.

If entry to View is initiated via a !Boot file, which is often the case in order to set up the printer, force lower case operation load a default template file and so on, it is a simple matter to include extra statements to transfer the date permanently into the current document.

If the template file already contains D, a function key can be defined to replace the D with the date, extracted from the full TIME$ string – while still effectively in Basic.

This function key can then be pressed with an FX command – once the command mode of View has been entered – provided the FX command is the very last one of the !BOOT file.

This is best illustrated with an example. First create a template letter such as this:

```
        My Street,
        Any Town,
        County,
        Post Code

        Tel: 0123 456789
RJ D

Dear
```

The following !Boot file will set up the printer, set up View, replace the D with the actual date and then enter View:

```
*BASIC
*FX15,1
VDU2,1,27,1,64,1,27,1,69,1,
27,1,73,1,1,3
*SHADOW
MODE3
VDU19,1,3;0;
OSCLI("KEY10 CHANGE/  D/"+M
ID$(TIME$,5,11)+"/|M"+"S ^Z
 M")
*WORD
*FX202,48
PRINTER KAGA
LOAD DUMMY
*FX 138,0,138
```

This is what the commands in this !Boot file do:
*BASIC *ensures that Basic is in control;* *FX15,1 *flushes the current input buffer to be on the safe side;* VDU2... *sets up the printer according to personal preference.* *SHADOW *gives maximum memory space for View documents.*

MODE3 *gives an 80-column display and ensures the shadow screen is invoked;* VDU19... *sets up coloured text;* OSCLI(... *defines function key 10 to replace D with the date.*
*WORD *enters View command mode;* *FX202,48 *forces lower case;* PRINTER KAGA *loads the printer driver;* LOAD DUMMY *loads the default template file and finally*
*FX138,0,138 *invokes function key 10 to perform the replacement.*

Function key 10 is chosen as, hopefully, the Break key would not itself be pressed while in View.

Any function key could be used, but KEY 10 then leaves the actual function keys free for use in edit mode.

*This function key definition not only replaces the D in the document with the actual date, but also uses the SEARCH command to enter the text mode of View as it is not possible to simulate Escape in View 3.0 by issuing *FX125.*

Acorn recommends using SEARCH ^? to enter View edit mode with the cursor on the first space. In the example given here, a hard space is placed two positions to the right of Dear *in the dummy letter and S ^Z then enters edit mode with the cursor set on this, all ready to enter the name of the addressee – which will actually overwrite the second hard space.*

This hard space is initially produced by entering any unique character, such as @, into the dummy letter and then, using CHANGE @ ^Z, *it is converted into a hard space.*

The dummy letter must then be resaved for future use. The only reason for using this hard space, instead of any old character, is that it does not show on the screen and, even if it does not get overwritten, it will only print out as a space. – **Peter Frost, Grimsby.**

Win a tenner

WANT to write to The Micro User? The addess is: Letters, The Micro User, Europa House, Adlington Park, Macclesfield, SK10 4NP.

Writers of the most interesting letters receive a £10 prize.

Inter-Word interchange

NOT many people know that if the first line of an Inter-Word document is centred or aligned right and you try to mark the first word wth Control+Z, the micro sometimes hangs up and Break is the only way out.

The same thing happens if you try to move back on to the first word with Control+Back Arrow, though it doesn't happen all the time, and I haven't worked out all the conditions which cause it yet. So be careful.

*Even fewer people know that Inter-Word clashes with a rom that nobody would have thought of, Superior's Speech! Take the SP8000 program, blow it into an eprom – although it will probably have the same effect from sideway ram – and then enter Inter-Word. Load new text and then type *DIR $ plus some other star command.*

Here comes the crunch – the new catalog of directory $ has Save Marked Section *written at the top. This doesn't normally affect the operation, but it can be a little off-putting when it happens for the first time.*

I don't suppose I'll get a tenner for this attempt, but it was worth a try. – **Tim Morley, Bolton, Lancs.**

● Quite right, there's no tenner this time, but you make an interesting point.

Delving again into Arcol

THANK you for the review of Arcol in the April issue – while it was factually correct there are a couple of points I'd like to make.

The main problem was that Arcol was designed to work on an Econet network and all the criticisms made were due to incorrect assumptions. The trouble with Econet is that it falls down badly when trying to transfer massive amounts of data.

The in-built printer drivers have been specially written to be fast but not dense. The gratuitous caption about the lack of outline fonts fails to take into account that an 11 year old

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would be utterly lost with the Acorn Font Editor and if outline fonts were really necessary the picture could be saved and imported to !Draw to add them.

The picture of Font Editor *in use is a conglomerate which also shows the Pattern Edit menu – this is impossible within Arcol and makes the Font Editor look more complex than it is.*

The use of Mode 13 is to provide future compatibility with out product Tabs which generates 3D models which can be loaded into Arcol. Tabs requires an A4 screen with the same X and Y resolution. – **Paul Richards, expLAN, 34 Drake Gardens, Tavistock, Devon PL19 9AT.**

Steve Bruntlett replies: I appreciate the comments about the network but Arcol *is* sold as a single user package too and the manual says nothing about these design considerations. Likewise for the use of Mode 13.

I think that new programs for the Archimedes should make use of the Risc OS environment rather than be written to go with an individual company's own products. Risc OS is the standard.

I made no negative comments about the fonts within the article, I only wrote about the font editor and its versatility. The caption wasn't mine but I agree with it and wish I'd mentioned it.

I agree that an 11 year old couldn't use Acorn's Font Editor, but he could make use of the ever-expanding range of fonts available.

The Font Editor picture didn't come out right – it was a conglomerate of the Colour Menu, Pattern Editor and Font Editor and should have been captioned as such.

Anyway, the summing up was very positive: "...but despite the niggles Arcol provides superb facilities and is excellent."

Protection problem

THERE seems to be a fault with the Protect File program in the December issue of The Micro User.

In lines 1670 and 1710 a : is used. Although it is in speech marks the micro thinks it means a multiple statement separator and therefore it generates an error. To get by this I changed the : to a = ,. making the checksums for 1670=F699 9, 1690=A21A 0 and 1710=A766 6. – **S. Harrison, West Midlands.**

● The fault is not in the program but in the machine code Assembler of Basic I. However, your solution is fine.

How to lay hands on Risk

IN the March 1990 issue of The Micro User, *K.H. Brook wanted to know if there was a version of the board game Risk for the BBC Micro. By coincidence, I recently wrote one, although it's only ADFS compatible with the Master 128/Compact.*

If anyone wants a copy just send a blank 80 track 5.25in or 3.5in disc and SAE to me. – **A.M. Sandman, 8 Lon Cedwyn, Sketty, Swansea, SA2 0TH**

● Thank you – could this be the start of 8 bit BBC Micro public domain software?

Ground rules for Apocalypse

THERE is a game similar to Risk called Apocalypse published by Command Software. Tlt is very complicated, featuring 16 pages of rules covering 10 game options from London to futuristic USA and can be played with one to four players.

It's only available by mail order from Command Software, Mitre House, Abbey Road, Enfield, Middlesex.

Prices are disc £14 and tape £9.95, although I would write to them first before you send any cheques. – **N.D. Rendall, Wiltshire.**

... something similar

There was a game similar to Risk called Empire by Shado Software but I don't know if it's still available – **G. W. Dunbar, Solihull, West Midlands.**

Sorting out those sorts

IN the library programs section of the November 1988 issue of The Micro User, there was a Basic shell sort routine by Phil Bender. However, I suspect it was largely a bubble sort in disguise due to a program error and I thought you would like to publish my findings.

In a shell sort, after a swap of a pair of items, the program should check if the lower of the pair just swapped should be swapped even higher up the list. In lines 190 and 200 of the library routine, J% is reduced by 1 after a swap. When gap% *is greater than 1 the result is that it will compare the pair which have just previously been compared – which are bound to be in sequence.*

There is no beneficial effect until gap% *is 1, when it effectively performs a Bubble Sort.*

To correct this error, just two lines need to be changed as follows:

```
190 ...:A%(G%)=T% ELSE J%=1
200 J%=J%-1:UNTIL J%=0
```

to:

```
190 ...:A%(G%)=T%:J%=J%-gap
% ELSE J%-0
UNTIL J%2
```

This small change reduces the time taken to sort 100 integers from 6 to 4 seconds – 1.5 times faster – but for larger numbers it is much more noticeable. For 2000 integers the time is reduced from 810 to 190 seconds – more than four times faster.

Incidentally, the time taken for an Archimedes to sort 2000 integers using the corrected program is 15 seconds – more than 12 times faster than the 8 bit BBC Micro – which shows the Archimedes speed, but running under !65Host it takes 415 seconds – twice as slow – which shows the poor emulation speed.

Unfortunately the same

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Multiple screen loading

I HAVE been both a devoted reader of your excellent magazine and enthusiastic programmer for some time. Just recently I have turned my attention towards creating simple Basic games.

*One of my most recently acquired techniques has been *SAVEing Mode 5 screens then *LOADing them into my programs to create the games screens.*

What I would like to do is *LOAD several screens into the memory then CALL them up when they are needed. How would I go about doing this? – **Henry Coles, Keighley, West Yorks.**

● Unless your screens are very tightly compacted – or you're using the Master's sideways ram – you won't be able to have more than two screens loaded at one time which will occupy a total of 20k. There's certainly no easy way of doing what you want.

Too chunky by far

I'D like to make a few points about the review of Knowledge Organiser in the May issue:

When KO imports a file it then has the same structure as any other record so can be edited as freely as any other. The lastest version of KO does highlight the found string during a search. Although it wasn't mentioned KO searching does support NOT. Finally I'd just like to point out that the screen display is not as chunky as it appeared in the screenshot. – **D. Jackson, Clares Micro Supplies, 98 Middlewich Road, Rudheath, Northwich, Cheshire CW9 7DA.**

● The problem with the screen shot occurred due some teething troubles in our new system – the Contents page of that issue shows what it should have looked like.

➤

error was also included in the otherwise excellent articles on machine code shell sorts by Peter Vasey in the March and April 1989 issues of The Micro User.

Applying the same change to a machine code sort inspired by those articles reduced the time taken for 2000 integers from 20 to 5 seconds – again four times faster.

How did I notice the error? While re-writing my BBC Micro program into an Arm code relocatable sort module for the Archimedes, I could not understand the time taken for large numbers, but I had to go back to basics before I finally found the well-travelled bug.

Incidentally the Arm code sort will now put 2000 integers into order in under half a second. – **Martin Avison, Hinckley, Leicestershire.**

Reading data line numbers made easy

A simple data retrieval program of mine carries certain information in the line numbers of the DATA statements. A search is made by RESTOREing to a number calculated from the INPUT string. The numbers are not conventionally arranged, having gaps of various sizes between them.

To make the program more flexible and user-friendly, it would be very useful to be able to do a string search and to READ the line number as well as the required strings stored with it.

Setting up an integer variable and counting from the first DATA line is theoretically possible but most unwieldy because of the random nature of the numbers.

In spite of a vast library of advanced books, I can't find how line numbers are stored in memory and how those attached to the DATA can be READ or PEEKed or whatever on the BBC B. Is it possible?

Your Micro Memories panels include notes on REPEAT UNTIL GET. This useful formula also helps readability of the program listing. But often you need to know the exact response, and I find the following line flexible and generally useful:

```
REPEAT X=INSTR("@YnNn",
GET$) DIV2 : UNTIL X>0
```

The @ is a dummy character – any other, such as ı, may be substituted. This routine covers the possibility that Caps Lock has been changed by the user before responding to an instruction to press a key.

The test string can contain any number of options, in pairs after the dummy, and the contents of X can then be used in a variety of ON or IF statement.

The test string can also take the form:

```
"@YyNnMm"+CHR$1
35+"@"+CHR$138
```

which includes two editing keys – the last character doesn't need a corresponding dummy.

You can modify the routine to include numerical keys as well: "@@Aa1Bb2" and then use DIV3. – **E. F. Jacobs, Leicester.**

● Reading the line number after reading some data is not quite as tricky as it may at first seem. What you need to look for is the DATA pointer located in zero page then finding the start of that line and from there it's easy to pick out the line number.

Try this program:

```
 10 REM Reading line nos
 20 REPEAT RESTORE
 30 FOR L%=1 TO RND(3)
 40 n$=FNread:NEXT
 50 PRINTn$" at ";J%
 60 UNTIL GET=13:END
 70 DEF FNread
 80 READ n$:J%=FNgln
 90 READ j$:=n$
100 DEF FNgln:LOCAL I%
110 I%=2+(!&1C AND&FFFF)
120 REP.I%=I%-1:U.?I%=13
130 =I%?1*256+I%?2
140 DATA First,f
150 DATA Second,s
160 DATA Third,t
```

Mouse driver for MSdos

I OWN a BBC A3000 and use the PC Emulator quite regularly to run various items of software. Although the A3000 comes with a mouse there seems to be no way of using it while running the PC Emulator.

According to a book on MSdos the way to use a mouse is to include the line:

```
DEVICE=MOUSEAnn.SYS
```

in the CONFIG.SYS file. I have carefully searched the catalogue of the MSdos system disc but there's no trace of this driver software.

Could you please tell me what I am doing wrong, or where to get one. – **Adam Gundy, Alford, Lincs.**

● We don't know of anyone who supplies a Risc OS mouse driver for MSdos. Can any reader help?

Amusement above all?

I AM continually disheartened by the proclivity towards entertainment shown by the computer industry.

Same old dreary games – even the educational stuff is intended to amuse first and teach second. I have been programming for five years or more using Basic and have enhanced my own knowledge and that of students in the electronics field with seriously presented programs.

I am now branching into the general education field to see what I can do for the youngsters of this world.

I only showed a spark of interest when I read the letters page, in particular the one from Leslie Duffen in the March issue.

I am glad there is at least one kindred soul as regards the use of the computer as a tool of learning. I also share her fear that she is probably wasting her influence. What about an hour a week learning Basic? – **D. Tranmer, Locking, Avon.**

● Surely wrapping up education in an interesting guise does not make it bad?

Golf handicaps

THE February issue of The Micro User *included Golfdes which is used to design holes for the Golf program on the same disc. For some mysterious reason I cannot save more than four holes on a disc.*

In addition the GDecode program for de–compacting the compressed Golf courses on the monthly disc seems to have a bug and crashes after reconstructing the first hole.

I am well and truly bunkered on this program, which I'd love to play properly. Can you help? – **Paul Downs, Anfield, Liverpool.**

● The difficulty lies in the fact that you only have a 40 track disc drive – so it will only save four holes as that's all there is room for. You can use another disc for the holes you create.

The GDecode program does have a bug. You can simply replace line 190 with:

```
190 UNTIL H%=9
```

However, you will run into the same space problem when decoding a course, but by following the screen prompts you can save to more than one disc.

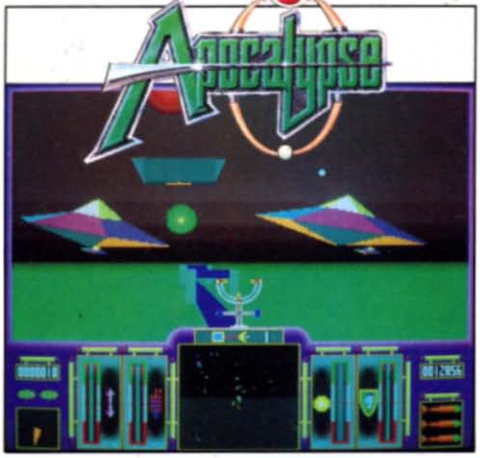
ALL programs printed in this magazine are exact reproduction of listings taken from running programs which have been thoroughly tested.

However, on the rare occasions when mistakes occur corrections are published as a matter of urgency. Should you encounter error messages when you type in a program, they will almost certainly be the result of your own typing mistakes.

Unfortunately we cannot answer personal programming queries concerning these mistakes. Of course letters about suggested errors will be investigated without delay, but any replies found necessary will only appear in the letters pages.

A3000
ARCHIMEDES
BBC B/MASTER
ELECTRON

THE 4TH



APOCALYPSE

Apocalypse is designed purely for the Archimedes. Utilising the machine's colossal processing power combined with ingenious programming techniques, the author has created a masterpiece which could not have been produced on any other home computer. The author is of course Gordon Key who already has Holed Out and E-Type under his belt. Apocalypse is by far his best work to date.

The game places you on the surfaces of varied futuristic hostile planets colonised by ruthless enemies. With your highly advanced craft you must find your way around the planets and systematically annihilate the enemy. Your ship, which can fly or move along the ground, is extremely fast and can even fight whilst hurtling backwards.

The graphics are truly unbelievable. The solid, shaded 3 dimensional buildings and objects are animated more quickly and smoothly than ever before. If you shoot at them they explode in a way that is terrifyingly real often catching fire before bursting into a ball of flames accompanied by devastating sound effects.

Initially Apocalypse is easy enough for a beginner to enjoy but as you progress your foes will become increasingly hostile and you will discover fascinating new objects. These can have strange properties and many may need to be destroyed. It will be up to you to discover how.

The Royal Guild of Spacing will monitor your progress as you play. Your performance will be assessed at appropriate times and you will need to impress them if you are to continue your adventure. Apocalypse is an amazing game. There's only one way to describe it....

RAW EXCITEMENT.

PRICE: A3000/Archimedes £29.95

A3000/ARCHIMEDES

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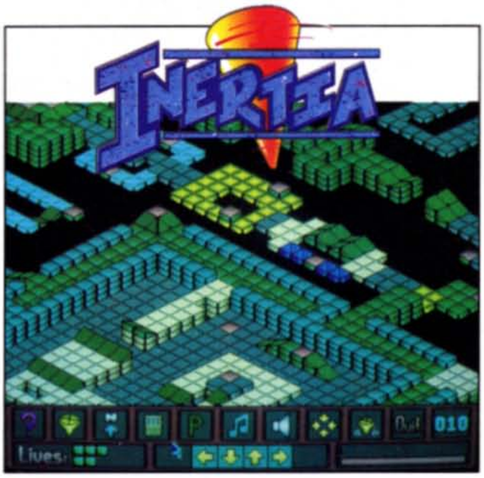
A3000/ARCHIMEDES

A3000/ARCHIMEDES



INERTIA

Inertia is a totally original game with a huge landscape just waiting to be explored. It is available for the Archimedes, BBC Micro and Acorn Electron. Scattered (or rather fiendishly placed) around the landscape are many special tiles which need to be collected. Your highly sensitive craft floats freely around the landscape and you must exert forces upon it to guide its speed and direction.

You have a 3 dimensional viewpoint displaying a tiny fraction of the total playing area. There are walls, bridges, tunnels and ramps to negotiate and a host of mystery tiles with strange properties indeed. These include ice, jump and transformation tiles. There are even certain tiles which alternate the controls so that everything works in reverse.

This massive game has been very carefully put together and solving the puzzles within it will need lateral thought and a lot of dexterity.

The Archimedes version is considerably enhanced with digitised sound and music. It even features a full colour 3 dimensional map of the game which is a joy just to wander around. You'll certainly be amazed at the size of the game and the variety within it.

Inertia is a game for the determined. Each version makes full use of the ability of the computer so make sure you've got plenty of time to spare. Once you have started you won't be able to stop.

Electron User Golden Game May'90

BBC Micro and Acorn Electron versions available ***NOW****.*
Enhanced Archimedes version available in June, 1990.

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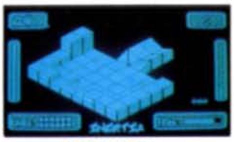
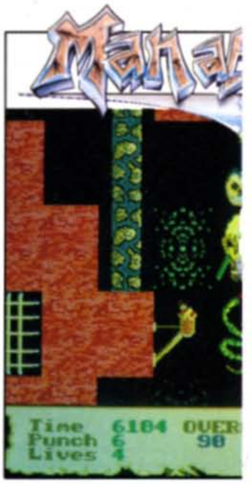


ELECTRON

A3000/ARCHIMEDES

A3000/ARCHIMEDES



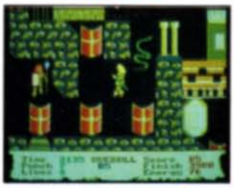
MAN-AT

In the age when the castle was supreme it took dedicated warriors to overcome their defences, to loot and pillage, and finally to destroy.

You are armed with a mighty sword cast from the remains of a thunderbolt which fell from the sky many millennia ago. Also in your possession is a magic potion which makes you invincable to all for short periods of time. Armed with these you must penetrate the inner recesses of 4 castles and do battle with all you find in them.

As you progress you will discover many intriguing objects which can behave very strangely. Many are documented such as wooden panels, hour glasses, thorns, portculli, mirrors etc.. But most are

PRICE: A3000/Ar



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DIMENSION

A3000
ARCHIMEDES
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Arms
ALL Score 90
Finish 5100
Energy 106

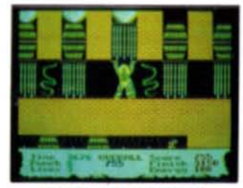
T-ARMS

not. When you think your stuck, experiment and you'll discover properties you never knew existed.

The subtle blend of arcade timing and adventurous puzzles make Man-At-Arms fiendishly addictive. You must plunder each of the 4 castles which become increasingly "puzzling" as you progress. Your overall objective is to kill all foes with your mighty sword and to plunder as much of the most valuable treasure as you can carry.

Man-At-Arms is a fascinating challenge with superb sound effects and music. No attention to detail has been spared and you can be sure of many late nights for weeks to come.

chimedes £19.95



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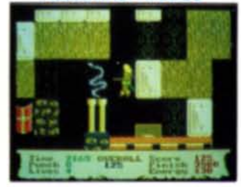

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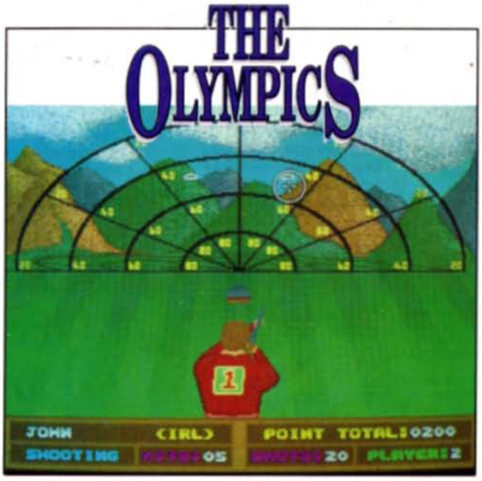

THE OLYMPICS

The Olympics is an experience which can be played by 1 to 8 players. It contains a superb piece of music, opening and closing ceremonies and 14 national anthems. When a player wins a gold medal the national anthem for his chosen country is played. Any World Records that you achieve can be saved to disc. With the click of a button all the relevant information concerning the record is automatically saved including your name, the exact time, day and date!

It is comprised of 6 main events: Diving, Shooting, Javelin, Swimming, Canoeing and Pole Vault. Some of these have several "sub-events" to choose from - there are 2 Shooting events, 12 Swimming events and 3 Canoeing events. These events have been chosen for maximum variety and enjoyment. They will "extract" all sorts of abilities: manual dexterity, timing, memory, perserverance, adaptability and above all guts!

The menu systems are controlled entirely with the mouse. As such they are extremely easy and quick to use. All events can be practiced or competed in individually, or altogether for maximum Gold, Silver and Bronze medals. You can also play all 6 events as a sort of "hex-athlon" where points are awarded for each event - the player with the greatest number of points is deemed to be the winner.

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WORLD RECORDS

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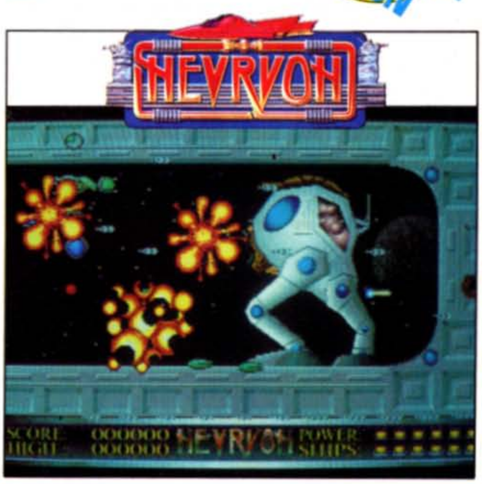

NEVRYON

This fast arcade game is disc based only and boasts 100K of graphics and game code for the BBC and 2 discs of over 1.5 megabytes for the Archimedes. It is a fast sideways scrolling shoot'em up which features 8 levels of furious opponents and very varied and very detailed graphics.

You fly a spaceship which can attain immense firepower - more lasers, a ram, gun droids and highly destructive missiles which are released from the top & bottom of your ship, then ignite and shoot forwards.

Whilst the BBC version is superb, the Archimedes version has been considerably enhanced and is truly exceptional putting many arcade games to shame. Nevryon uses the machine's raw power to full effect and gameplay is second to none.

It comes on 2 discs and features 5 true levels of parallax scrolling, more than 50 objects on screen, over 1 megabyte of 256 colour graphics, digitised stereo sound and music etc. etc.. You control a different ship on each of the 4 scenarios and there are a seemingly infinite number of weapons to collect and use. End of level monsters are beautifully animated but are anything but friendly.

BBC Review: "Graphics are very colourful and hectic, with explosions, missiles and aliens all heading for your ship. Together with a scrolling landscape, complete with stars moving in the background, they combine to form an enjoyable and action packed game." Micronet, Feb'90.

*BBC Micro version available **NOW**.*
Enhanced Archimedes version available in June, 1990.

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BBC B/MASTER

BBC B/MASTER

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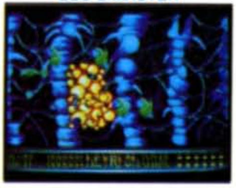

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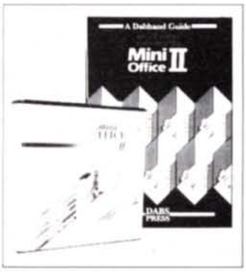

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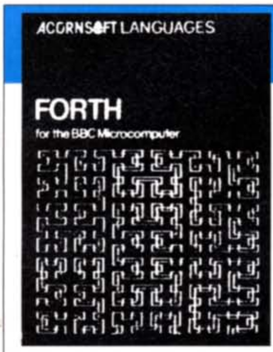

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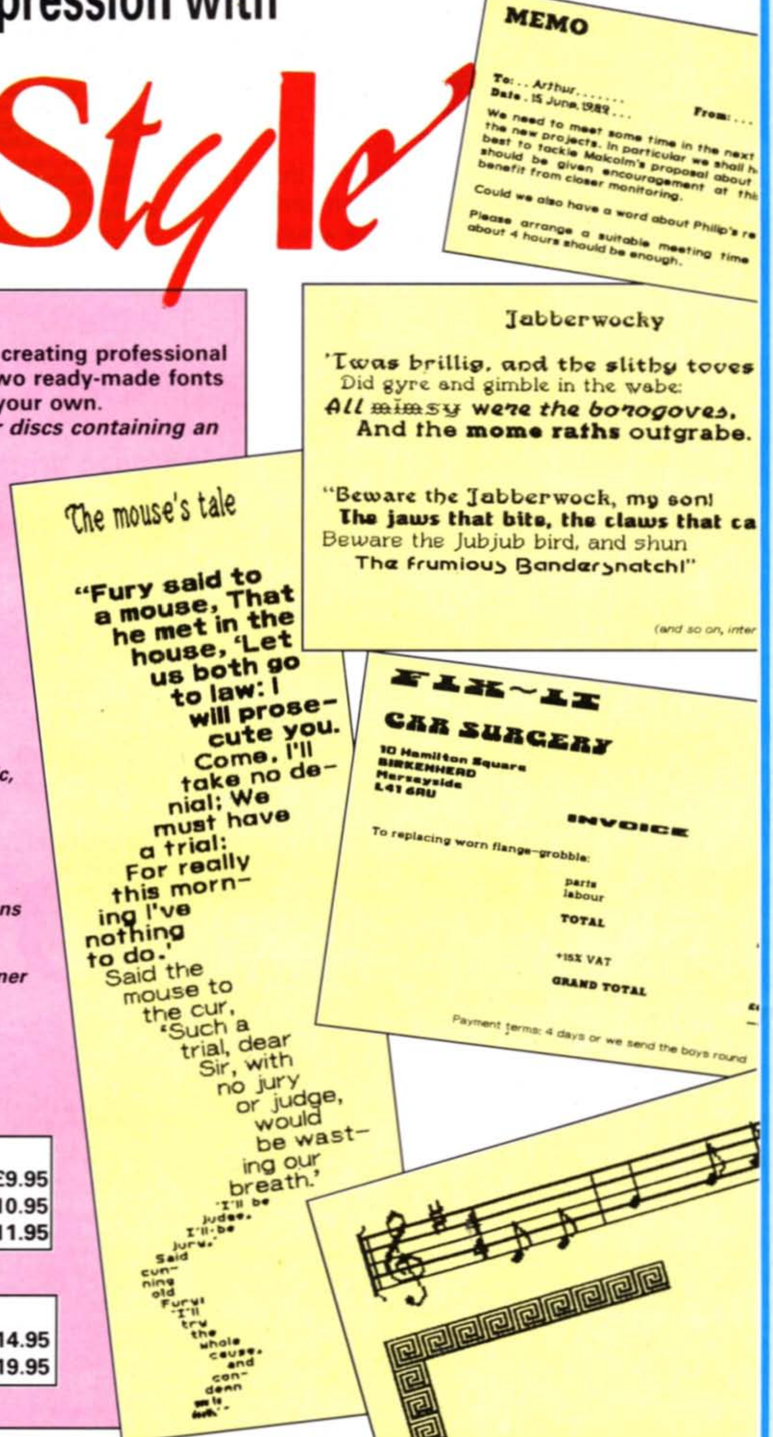

MEMO

To:...Arthur........
Date. 15 June, 1989....
From:...

We need to meet some time in the next
the new projects. In particular we shall h
best to tackle Malcolm's proposal about
should be given encouragement at thi
benefit from closer monitoring.

Could we also have a word about Philip's re

Please arrange a suitable meeting time
about 4 hours should be enough.

Jabberwocky

'Twas brillig, and the slithy toves
Did gyre and gimble in the wabe:
All mimsy were the borogoves,
And the **mome raths** outgrabe.

"Beware the Jabberwock, my son!
The jaws that bite, the claws that ca
Beware the Jubjub bird, and shun
The frumious Bandersnatch!"

(and so on, inter

The mouse's tale

"Fury said to
a mouse, That
he met in the
house, 'Let
us both go
to law: I
will prose-
cute you.
Come, I'll
take no de-
nial; We
must have
a trial:
For really
this morn-
ing I've
nothing
to do.'
Said the
mouse to
the cur,
'Such a
trial, dear
Sir, with
no jury
or judge,
would
be wast-
ing our
breath.'
'I'll be
judge,
I'll be
jury,'
Said
cun-
ning
old
Fury!
'I'll
try
the
whole
cause,
and
con-
demn
[illegible]

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(see page 116)

Fontstyle	5.25" (40/80T)	£9.95	*2108*	☐
Fontstyle	3.5" (BBC ADFS)	£10.95	*2109*	☐
Fontstyle	(Archimedes)	£11.95	*2110*	☐
64 Fonts	5.25" (40T)	£14.95	*2115*	☐
64 Fonts	5.25" (80T)	£14.95	*2116*	☐
64 Fonts	3.5" (BBC/Archimedes)	£19.95	*2117*	☐

Arcade Game Creator (DFS only)

(see page 117)

Cassette & Manual	£9.95	*2268*	☐
5.25" disc (40T) & Manual	£11.95	*2269*	☐
5.25" (80T) & Manual	£11.95	*2270*	☐

Keyword

(see page 117)

Archimedes	3.5" disc	£19.95	*2352*	☐
BBC/Electron	3.5" ADFS disc	£14.95	*2351*	☐
BBC/Electron	5.25" 80T DFS disc	£14.95	*2353*	☐
BBC/Electron	5.25" 40T DFS disc	£9.95	*2354*	☐

Acorn Computing

(see page 117)

Acorn Computing Magazine	£2.50	*2356*	☐
Magazine + Disc	£6.95	*2357*	☐

Fun School + Nursery Rhymes

(see page 116)

Cassette	£9.25	*2090*	☐
5.25" Disc BBC B, B+ (40T)	£12.95	*2091*	☐
5.25" Disc BBC B, B+ (80T)	£19.95	*2092*	☐

Classic Games Compendium

NEW

(see page 116)

5.25" Disc (40T)	£14.95	*2758*	☐
5.25" Disc (80T)	£14.95	*2759*	☐

Ten of the Best Educational Programs

(DFS only)

Cassette	£5.95	*2189*	☐
5.25" Disc (40T)	£6.95	*2190*	☐
5.25" Disc (80T)	£6.95	*2191*	☐

Read and Learn *(see page 54)*

NEW

(Prof plays a new game)	£17.99	*2732*	☐

Battery charger

Plus post and packing £1.50	£19.95	*2123*	✓

Dust covers

BBC B & B+	£3.95	*2220*	☐
BBC Master	£3.95	*2222*	☐
BBC Master Compact	£3.95	*2224*	☐

£ p

Perfect Pair

(see page 116)

Available For:	MO2	Book	Example Disc	Price	Code	Please Tick
Tape users	●	●	–	£19.95	*2271*	☐
Model B, B+ (40T disc)	●	●	–	£21.95	*2272*	☐
Model B, B+ (80T disc)	●	●	–	£21.95	*2273*	☐
Master (5.25" 40T disc)	●	●	–	£24.95	*2281*	☐
Master (5.25" 80T disc)	●	●	–	£24.95	*2276*	☐
Model B, B+ (40T disc)	●	●	●	£29.95	*2274*	☐
Model B, B+ (80T disc)	●	●	●	£29.95	*2275*	☐
Master (5.25" 40T disc)	●	●	●	£32.95	*2282*	☐
Master (5.25" 80T disc)	●	●	●	£32.95	*2277*	☐

Binder

£5.95	*2756*	☐

Disc storage box

5.25" discs only	£4.95	*2052*	☐

Soundblaster

(see page 32)	£34.99	*2360*	☐

Impact Specials

	Tape			5.25" 40T/80T			3.5"		
U.I.M.	–	–	☐	£17.95	*2733*	☐	£19.95	*2734*	☐
Arcade Soccer	£7.95	*2735*	☐	£10.95	*2736*	☐	£11.95	*2737*	☐
White Magic	£7.95	*2738*	☐	£10.95	*2739*	☐	£11.95	*2740*	☐
White Magic 2	£7.95	*2741*	☐	£10.95	*2742*	☐	£11.95	*2743*	☐
Holed Out	£10.95	*2744*	☐	£12.95	*2745*	☐	£13.95*	*2746*	☐
Holed Out Extra 1	£7.95	*2747*	☐	£9.95	*2748*	☐	£10.95	*2749*	☐
Holed Out Extra 2	£7.95	*2750*	☐	£9.95	*2751*	☐	£10.95	*2752*	☐
Holed Out Bundle of 3	£24.95	*2753*	☐	£29.95	*2754*	☐	£34.95	*2755*	☐

*Not available for Archimedes. Compact only

Database Publications DTP

(see page 117)

5.25" DFS 40 Track	£14.95	*2145*	☐
5.25" DFS 80 Track	£14.95	*2146*	☐

Morley Teletext Adapter

Teletext Adapter (40T utilities disc) + Design 7 Plus	£99.95	*2157*	☐
Teletext Adapter (80T utilities disc) + Design 7 Plus	£99.95	*2158*	☐
Power Supply	£9.95	*2054*	☐

DTP Yearbook 1990

£14.95	*2125*	☐

Forth Rom

(see page 116)

£19.95	*2046*	☐

Add £4 per Rom for Europe & Eire £15 Overseas

Addition for postage: Europe & Eire add £3 ☐
Overseas add £5
(Unless otherwise indicated)

➡ ➡ ➡ ➡ ➡ ➡ ➡ ➡ ➡ **TOTAL** ____

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____________ Post Code ____________

Daytime telephone number in case of queries ____________

MU6

Listing I

```
 10 REM M/c Code - Listing I
 20 REM by Mike Goldberg
 30 REM (c) The Micro User
 40 FOR L%=0 TO 2 STEP 2
 50 P%=&3E00
 60 [OPT L%
 70  JMP doBack
 80  JMP doDraw
 90  JMP doEras
100  JMP doEnd
110 .doBack
120  LDA #&20:STA &70
130  LDA #&5D:STA &71
140  LDX #0
150  LDA #8:STA &79
160 .loop_b
170  LDY #0
180  LDA #32:STA &80
190  LDA &4000,X:STA &72
200  LDA &4001,X:STA &73
210 .draw_b
220  LDA (&72),Y:STA (&70),Y
230  INY:DEC &80:BNE draw_b
240  CLC
250  LDA &70:ADC #&20:STA &70
260  LDA &71:ADC #&00:STA &71
270  INX:INX:DEC &79:BNE loop_b
280  RTS
290 .doDraw
300  LDY #0:LDX #32
310 .draw_d
320  LDA (&77),Y:STA (&74),Y
330  INY:DEX:BNE draw_d
340  CLC
350  LDA &74:ADC #&40:STA &74
360  LDA &75:ADC #&01:STA &75
370  CLC
380  LDA &77:ADC #&20:STA &77
390  LDA &78:ADC #&00:STA &78
400  DEC &76:BNE doDraw:RTS
410 .doEras
420  LDY #0:LDX #32
430 .draw_e
440  LDA #0:STA (&74),Y
450  INY:DEX:BNE draw_e
460  CLC
470  LDA &74:ADC #&40:STA &74
480  LDA &75:ADC #&01:STA &75
490  DEC &76:BNE doEras:RTS
500 .doEnd
510  LDA #8:STA &81
520  LDA #&20:STA &74
530  LDA #&5D:STA &75
540 .init
550  LDA #6:STA &80
560 .again
570  LDA #4:STA &70
580  LDA &82:STA &77
590  LDA &83:STA &78
600 .doAgain
610  LDY #0:LDX #32
620 .draw_x
630  LDA (&77),Y:STA (&74),Y
640  INY:DEX:BNE draw_x
650  CLC
660  LDA &74:ADC #&40:STA &74
670  LDA &75:ADC #&01:STA &75
680  CLC
690  LDA &77:ADC #&20:STA &77
700  LDA &78:ADC #&00:STA &78
710  DEC &70:BNE doAgain
720  DEC &80:BNE again
730  SEC
740  LDA &74:SBC #&E0:STA &74
750  LDA &75:SBC #&1D:STA &75
760  DEC &81:BNE init:RTS
770 ]:NEXT
780 *SAVE ACode4 3E00 3F00
```

Get it right ✓

```
 10 =    0 0
 20 =    0 0
 30 =    0 0
 40 = AAB9 9
 50 =  A65 8
 60 = 1EF3 2
 70 = CB24 2
 80 = 4351 1
 90 = 7561 1
100 = 20D6 F
110 = D5F9 A
120 = E710 7
130 = DCFF F
140 = EA45 7
150 = 5395 E
160 = 73F1 8
170 = 9CF1 8
180 = 5CB8 F
190 = 163F 0
200 = DE57 3
210 = 7C59 9
220 = E1AD 7
230 = 77A7 7
240 = 74FB A
250 = 3F16 D
260 =  18C F
270 = 126D C
280 = 9843 D
290 = 5D8C 1
300 = CBFD 3
310 = 1C9F 9
320 =  3AA B
330 = 1899 E
340 = 74FB E
350 = FC8A D
360 = 5A8C 6
370 = 74FB 9
380 = BF24 8
390 = 91FB 1
400 = BC93 0
410 = 6BBC D
420 = CBFD F
430 =  CBE F
440 = A268 A
450 =  8B8 C
460 = 74FB 0
470 = FC8A E
480 = 5A8C 6
490 = 7246 E
500 = 5A17 6
510 = C2A3 F
520 = A794 F
530 = 9C7B 2
540 = 6272 A
550 = A1F5 1
560 = 9E58 F
570 = 77AC A
580 = 4EEB 4
590 = 5427 4
600 = 2EF9 0
610 = CBFD 3
620 = CF22 1
630 =  3AA 8
640 = CB24 D
650 = 74FB 4
660 = FC8A 5
670 = 5A8C 0
680 = 74FB 1
690 = BF24 4
700 = 91FB 3
710 = 550E E
720 = A638 E
730 = 8D00 3
740 = F946 E
750 = 5CD6 B
760 = C29C A
770 = DA42 D
780 = E4C5 7
```

Listing II

```
 10 REM Sprites - Listing II
 20 REM by Mike Goldberg
 30 REM (c) The Micro User
 40 MODE7
 50 HIMEM=&4A00:H%=HIMEM
 60 T%=FNstart:Q%=FALSE
 70 X%=ASC"X":A%=ASC"@"
 80 REPEAT T%=T%+5:VDU42:REPEAT
 90 IF ?T%<>X% PROCput ELSE Q%=TRUE
100 UNTIL ?T%=13 OR Q%
110 UNTIL Q%:X%=&700:Y%=X%DIV256
120 $X%="SAVE 33ikons 4A00 "+STR$~H%
130 CALL&FFF7:END
140 :
150 DEF PROCput
160 ?H%=?T%-A%+(T%?1-A%)*16
170 H%=H%+1:T%=T%+2:ENDPROC
180 :
190 DEF FNstart:LOCAL P%
200 P%=PAGE:REPEATP%=P%+P%?3
210 UNTIL$(P%+4)="START":=P%+P%?3
220 :
230 START
240 *@@@@@BEBG@CF@A@@@@IDO@F@LIAEN@FI
250 *@@@EEFGHLBMEI@F@@@@@@JHL@EFHLB@@
260 *@@@A@@@@@@@@@@@@@@@@ADIHA@A@A@C@
270 *@@HAL@L@L@L@N@@@HH@@@@@@@@@@@@@@
280 *@@@@@C@CAF@C@C@A@@@L@NHDLBHFAE@@
290 *@@@BAFABAF@G@CHH@@@L@NHF@L@L@@@@
300 *@@@@@@@@@@@@@@@@@@AAAABBLLAABBDD
310 *@@DFDGEFIHBBBBAA@@@L@LHFHF@L@@@@
320 *@@AAAAAC@G@G@G@C@@OOAAAIAMAMAEAI
330 *@@OOAAAC@G@G@G@C@@OO@@@H@L@L@D@H
340 *@@@@@@@@@@@@@@@@@@AAAC@G@G@G@C@@
350 *@@@@@H@L@L@D@H@@@@@@@@@@@@@@@@@@
360 *@@G@GBC@O@G@K@O@@@G@O@O@CLCLCHOA
370 *@@N@O@O@LCLCLAOH@@N@NDL@O@N@M@O@
380 *@@O@M@K@O@O@G@A@@@N@N@N@F@HAN@O@
390 *@@G@G@G@F@AHG@O@@@O@K@M@O@O@N@H@
400 *@@IOIMKOIOIMKOIO@@OOOOCOCCCOCCOO
410 *@@OOOOOOOOOOOOOO@@OOOOOOOOOOOOOO
420 *@@OOOOOONONONONN@@OOOOEO@EJOJOJJ
430 *@@OOOOLOHLKOHKLL@@IOIKIMIOIIOOOO
440 *@@JJ@@JJ@@JJ@@JJ@@JJ@@JJ@@JK@@KL
450 *@@JK@@CD@@O@@@O@@@JJ@@JF@@LB@@BJ
460 *@@JK@@KL@@KL@@JK@@O@@@O@@@LB@@BJ
470 *@@LB@@BJ@@JJ@@JJ@@JJ@@JJ@@JJ@@JJ
480 *OOHHOHOHOHJMJMJMOO@@O@O@O@JEJEJE
490 *OO@@O@O@O@EJMBEJOOAAOAOAOAKEKEKE
500 *JMJMHJMHOHOHOHOOJEJEBIF@O@O@O@OO
510 *EBMBDKD@O@O@O@OOKEKEIGIAOAOAOAOO
520 *O@H@OGOGOGIGHEJGO@@@OOOOOOMOHMJO
530 *O@@@OOOOOOMOHMJOO@A@ONONONINILIN
540 *JGJGHFIAOGOGOGO@JOJOHJMMOOOOOOO@
550 *JOJOJOJJOOOOOOO@ILKNINIHONONONO@
560 *@@@A@A@@CCAAAAAAH@HD@L@HEAGCGGOO
570 *A@AB@CBCJHNLNNOO@@@H@H@@LLHHHHHH
580 *BBCCGGGGGGGGOOOOOOOOOOOOOOOOOOOO
590 *OOOOOOOOOOOOOOOODDLLNNNNNNNNOOOO
600 *OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
610 *OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
620 *OOGGGGCCCCAA@@@@OOOOOOMMNNOOOOCC
630 *OOOOOOKKGGOOOOLLOONNNNLLLLHH@@@@
640 *@@@A@A@@CCCCGGGGH@IECOGOGGOOOOOO
650 *A@IJLONONNOOOOOO@@@H@H@@LLLLNNNN
660 *GGGGOOOOOOOOOOOOOOOOOOOOOOOOOOOO
670 *OOOOOOOOOOOOOOOONNNNOOOOOOOOOOOO
680 *OOOOOOOOGGGGGGGGOOOOOOOOOOOOOOOO
690 *OOOOOOOOOOOOOOOOOOOOOOOONNNNNNNN
700 *CCCCCCCCAABEC@A@OOOOOOMMNNOOOCL@
710 *OOOOOOKKGGOOOLC@LLLLLLLLHHDJL@H@
720 *AA@@@@@@@@AABCBC@@KKOOGGGGCKCOJF
730 *@@MMOONNNNLMLOEFHH@@@@@@@@HHDLDL
740 *FFGGGGGGOOOOOOOOJBGGOOOOOOOOOOOO
750 *EDNNOOOOOOOOOOOOFFNNNNNNOOOOOOOO
760 *OOOOONNLMIOOOOOOOOLL@CCOOOOOOOOO
770 *OOOCC@LLOOOOOOOOOOOOOOGGCKIOOOOO
780 *OOOOGGGGGGCCAA@OOOOOOOOOMMNNOOGG
790 *OOOOOOOOKKGGOONNOOOONNNNNNLL@@@@
800 *AA@@AA@@BBCCFGFGCCOOOOOOGGCKCOJF
810 *LLOOOOOONNLMLOEFHH@@HH@@DDLLFNFN
820 *FFGGOOOOONNHLJLHJBGGOLLJHB@H@H@@
830 *EDNNOCCEAD@A@A@@FFNNOOOOOGGACECA
840 *NLNLNLONGGGGGGGG@@@@@H@JIBNHMMOO
850 *@@@@@A@EIDGAKKOOGCGCOGNNNNNNNN
860 *CCCCCCCCAA@@C@BEOOOOMMNNOOOCN@LB
870 *OOOOKKGGOOOLG@CDLLLLLLLLHH@@L@DJ
880 *@@@@@@@@@@@@@@AA@A@CDCDAH@NFOGGC
890 *@@HAHAA@IHNLOOOO@HDHDH@H@@@@@@HH
900 *CCCCGGGGGGOOOOOOOOOOKKOOOOOOOOOO
910 *OOOOOOOOOOOOOOOOHHLLLLNNNNOOOOON
920 *OOOOOOOOOOOOGGGGONNLMMOOOOOOOOOO
930 *OCC@LLOOOOOOOOOOOMMACCOOOOOOOOOO
940 *GGGGGGGGBBBBAA@OOOOOOOOOOOGGKKOO
950 *OOOOOOOOOOOOOOOONNNNNNLLLLLLHH@@
960 *@@AACCCCCCGGGGGGOOCCIILNININHJMM
970 *HHLMNONNOOOOMMMM@HDHD@HHHHHHLLLL
```

All program listings in this issue can be downloaded FREE on...
MicroLink

➤

```
980 *GGGGOOOOOOOOOOOOOOOOOOOOONNMLIHD
990 *OOOOOLLIHD@D@@@@LHH@@H@@BDGKGKGK
1000 *OOOOOOOOOOOOGGGGKDI@N@IBLJOLOOOO
1010 *@BIBCIGKOGOOOOOOOGOOOOOONNNNNNNN
1020 *EEEEBBCCAA@@@@@AOOOOOOGGOLOHO@NA
1030 *OOOOOOOONNI@D@JDLLLLHH@@H@N@DJ@@
1040 *@ABABA@A@@@@@@AA@@AHAHH@IAGCOOOO
1050 *@H@LBLBHA@GFONNL@@@@@@@@@@@@@@HH
1060 *AACCCCGGGGOOOOOGOOOOOOOOOOOOOOOO
1070 *MMOOOOOOOOOOOOOOLLLLNNNNNNOOOOOO
1080 *OKKHLLOOOOOOOOOOOOLL@CCOOOOOOOOO
1090 *OGGCKKOOOOOOOOOOOOOOOOOOOOOONNNN
1100 *GGGGGGCCCCCCAA@OOOOOOOOOOOOOOOOO
1110 *OOOOOOOOOONNMMOONNNNNNNNNDDDHH@@
1120 *@ABABA@AAAAACCCCAACKGOGGOOOOKKKK
1130 *OOLLIICGIGIGAEKK@@HHLLLLLLNNNNNN
1140 *CAA@@A@@DBNMNMNMOOOOOCCIAB@B@@@@
1150 *OOOOOOOOOGGKCIABNNNNOOOOOOOOOOOO
1160 *ONOOOOOOGGGGGGGG@DIDLINMONOOOOOO
1170 *MBI@G@IDCEOCOOOOOOOOOOOOOOOONNNN
1180 *CCCCAA@@A@G@BE@@OOOOOOOOGGI@O@EB
1190 *OOOOOONNOCOAO@GHJJJJDDLLHH@@@@@H
1200 *@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
1210 *@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
1220 *@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
1230 *@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
1240 *@@G@G@G@G@FADC@@NALCLCNAO@O@GH
1250 *@@GHCLCLGHO@O@O@@@O@O@MBHGMBO@O@
1260 *@@NAO@O@O@KDANKD@@O@O@MBHGMBO@O@
1270 *@@O@KDO@LCHGLCO@@@N@N@N@N@FHN@N@
1280 *N@HAIBJAKBKCKBKB@@JEEJJEEJO@OOOH
1290 *@@JEEJJEEJO@OOO@G@I@EHIDEHMDMLMD
1300 *KBKBKBKBKBMAN@O@NINHOHOHOHOHOO@@
1310 *MBALC@O@O@O@OO@@MDMDMDMDMDMDIHG@
1320 *HGBHEHBH@L@N@NHN@OOOAG@@O@N@L@H@
1330 *@OOOHN@@O@G@C@A@ANDAJADA@C@G@GAG
1340 *HN@N@N@LBHEHBHHGN@N@N@O@@@AGOO@O
1350 *G@G@G@O@@@HNOO@OAG@G@G@CDAJADAAN
1360 *@@MAMAMAMAMAMAAA@@OO@OGOGOGOGO
1370 *@@OO@ONONONONONO@@KHKHKHKHKHKHHH
1380 *OODGJCMAN@O@O@O@GOGOOOGOKOEGJCMA
1390 *NONOOONOMOJNELKHOOBNELKHG@O@O@O@
1400 *OOOKOONNOOOOOOOOONNMMOOONNNJNNNHA
1410 *GGKKOOOGGGEGGGAHOOOMOOGGOOOOOOOO
1420 *OOOOOOOONNOOOKOOHANNJNNNONOOMMNN
1430 *AHGGEGGGOGOOKKGGOOOOOOOOGGOOOMOO
1440 *JGDO@K@OANANANEB@O@N@M@J@LHDL@FH
1450 *@O@G@KADABABABABENBO@M@OHGLCFICM
```

SUBSCRIBE NOW!

If you'd like to save the wear and tear on your fingers you'll find this listing – together with all the others from the issue – on this month's disc, sent free if you subscribe to *The Micro User*.

```
1460 *OHCLAN@O@ODO@KJGCLAL@L@L@J@M@N@O
1470 *ABIBMBG@CDAJ@G@O@N@O@O@O@OBO@MEN
1480 *KLHOHOHOLKNININI@O@OFIO@O@O@FI@O
1490 *CLCLCLAN@O@O@OCLMCMCMCIGAOAOAOAO
1500 *LKINININHOHOLKNILCNANANALCANCLCL
1510 *GHGHGHCL@OHGLCLCIGKEKECMCMAOAOGI
1520 *B@A@HCDCBD@L@I@CB@BMH@AACGFNDLLL
1530 *D@DKA@HHLNFOBGCCD@H@ALBLDB@C@I@L
1540 *@G@K@K@MDJIFBAD@LLLLDLFNCOACDHHC
1550 *CCCCBCFGLOHLBAAL@N@M@M@KBEIFDHB@
1560 *F@A@HCDCBD@LAHC@B@BMH@AAGCNFLDLL
1570 *D@DKA@HHNLGNCFCCF@H@ALBLDB@CHAL@
1580 *C@CHCHALDJIFBAD@LLLLLDNFOCCADHHC
1590 *CCCCCBGFOLLHBAALL@LALAHCBEIFDHB@
1600 *@A@B@B@A@@@@@@@C@@AAH@EAB@OAB@CKD
1610 *O@O@G@O@G@O@G@O@J@L@L@L@L@N@O@
1620 *EBO@O@O@O@G@OOOOMBN@O@O@O@O@OOOO
1630 *O@O@O@O@O@OAOOOOM@M@M@C@O@OONNOO
1640 *OOOLMHH@M@KAKAKAO@@@@@O@OOOOOOOO
1650 *O@@@@@O@OOMOHOMOOOOCKAA@K@MHMHMH
1660 *KAKAKAM@H@MHNLONOOOOOOOOOO@@@@@O@
1670 *OOOOOOOOO@@@@@O@MHMHMHK@A@KAGCOG
1680 *OOOONNLMLMHKHI@FHH@G@K@L@K@GAFCL
1690 *@@@N@M@C@M@NHFLCOOOOGGCKCKAMAI@F
1700 *@F@EHKLMNNOOOOOOCLCDAF@K@M@EHJLM
1710 *LCLBHF@M@K@JAECK@F@JAMCKGGOOOOOO
1720 *@@ONOAOAONONONOA@@OBOMOMOBOBOBOM
1730 *@@OCOLOLOCOCOCOL@@OIOFOFOIOIOIOF
1740 *@@OIOFOFOIOIOI@@@@OMOBOBONOMOM@@
```

Get it right ✓

```
1750 *@@OLOCOCOCOOOL@@@@OFOIOIOIOIOF@@
1760 *@@O@O@O@O@@O@O@O@@HGHGHGHGGHGHGH
1770 *@@ANANANANNANANA@@N@N@N@N@@N@N@N
1780 *@@O@O@O@O@@O@O@O@@HGHGHGHGGHGHGH
1790 *@@ANANANANNANANA@@N@N@N@N@@N@N@N
1800 *@@CGCGDGDGCGCGDG@@COCOLOLOCOCOLO
1810 *@@COCOLOLOCOCOLO@@COCOLOLOCOCOLO
1820 *@@CGCGDGDGCGCGDG@@COCOLOLOCOCOLO
1830 *@@COCOLOLOCOCOLO@@COCOLOLOCOCOLO
1840 *OOOONNLMLIJAJCJCHH@G@HG@O@GH@OEO
1850 *AA@N@AN@O@NA@OJOOOOOGGCKBHEHELEL
1860 *JCF@IIOOOONNOOOOEO@O@GHH@EBMAFHK
1870 *JO@O@NAA@JDKHFAMELF@IIOOOOGGOOOO
1880 *OOKHG@CDAFHJHJ@DOOCCMAN@O@CHAJ@K
1890 *OOLLKHG@O@LBHF@FOOMAN@LBHBAIAI@B
1900 *DBF@KHKHMLMLNNOO@C@H@M@MLAO@O@C@
1910 *@F@A@E@ECDO@O@L@BHFHMAMAKCKCGGOO
1920 *OOOONNLMHJ@GGHEHHK@DCKGGOODD@K@L
1930 *GGGOGGOOLLHKCDBLOO@D@JHJ@B@JHFIE
1940 *EHGHGH@GHHOOOOOOCHCHGHG@C@@@@@@@
1950 *BDCDKDHC@@CCCCCCIEIEIECKGGOOOOOO
1960 *OOOONFLILMLMLALMHH@G@O@O@O@M@M@N
1970 *CCAM@N@O@O@G@G@OOOOOOMGCGGGGGAGG
1980 *NLOKOOOOOONNOOOO@N@F@F@FG@GHG@G@
1990 *@NAMAMAMMALBMAMAOGOKOOOOOOOOOOOO
2000 *OOOOOONNNNMLMLKHOOJJE@M@K@N@KDO@
2010 *OOGGKCH@C@G@O@O@OONNLMHK@BHBHBHD
2020 *KHF@EAMAJBBJEDNNM@C@F@A@I@J@B@MM
2030 *O@O@O@O@C@B@F@IIKCKCKCKCMAEAKCGG
2040 *OOLLMLKHHKKHKHJIAAN@FIIFEJMBJEGH
2050 *KKEAL@M@KDGHFIIFOOOOOOEEB@EAMAMA
2060 *MLLLKHMLNNOOOOOOO@LCCLO@FAHHOOOO
2070 *EJNALCCLG@F@IAGGEIKCKCEIHD@BHJLM
2080 *HO@HCKCKCKCKCJCK@O@@OOOOOOOOOOOOG
2090 *@O@@OOOOOOOOOOOO@N@ANONONONONONO
2100 *CJCKCJBJCKCKCK@GNKJBGGOOOOOOOO@O
2110 *OOOOOOOOOOOOOO@OJOJKNONONONONOAO
2120 *FBJBH@H@L@DC@B@B@@@A@B@B@B@NBBA@
2130 *@@@H@D@D@D@GDDH@FDEDA@A@C@BL@D@D
2140 *@B@BDCL@H@H@JBFBA@BB@N@B@B@B@A@@
2150 *H@DD@G@D@D@D@H@@@D@DBLC@A@A@EDFD
2160 *DFJJHHHHLLDG@BCA@@@A@B@B@BAOB@AA
2170 *@@@H@D@D@DHOD@HHBFEEAAAACCBN@DLH
2180 *CA@BDGLLHHHHJJDFAAB@AO@B@B@B@A@@
2190 *HHD@HO@D@D@D@H@@LH@DBNCCAAAAEEBF
2200 *OOOOLLHK@G@E@G@GOOOOGGCKAMAEAMAM
2210 *@E@F@GHKLLOOOOOOAEAMAMCKGGOOOOOO
2220 *XX
```

```
  10 =    0 0 | 290 = 5E60 7 | 570 = 3E9A A | 850 = 748A 3 | 1130 = 4CF6 1 | 1410 = 9704 6 | 1690 = E702 8 | 1970 = C8C7 1
  20 =    0 0 | 300 = 6D1B E | 580 = A2E7 8 | 860 = 20D9 0 | 1140 = 27D6 A | 1420 = DC3B 3 | 1700 = F309 2 | 1980 = 6B4B F
  30 =    0 0 | 310 = 4464 A | 590 = 1BDF 7 | 870 = F126 E | 1150 = 9815 7 | 1430 = D86A 3 | 1710 = CD13 C | 1990 = 2198 A
  40 = 8AFC C | 320 = 6A77 5 | 600 = 2B68 9 | 880 = 2A69 C | 1160 = 48A4 9 | 1440 = 538D A | 1720 = 7935 7 | 2000 = C6C6 2
  50 = 788E C | 330 = CC81 A | 610 = 2B68 A | 890 = 3F90 1 | 1170 = 8E5B 6 | 1450 = B5BB F | 1730 = 82AE 6 | 2010 = 32A8 C
  60 = A532 D | 340 = E04B 8 | 620 = 73E4 8 | 900 = FF3D C | 1180 = 1D8C A | 1460 = C0DD 1 | 1740 = 2808 7 | 2020 = 842B B
  70 = E5E2 1 | 350 = F83D 6 | 630 = E2D0 8 | 910 = 6FF6 1 | 1190 =  1B1 C | 1470 = 1BB4 A | 1750 = CA76 8 | 2030 = BE59 6
  80 =  12D A | 360 = 3B7E 3 | 640 = 64F0 8 | 920 = CCF1 9 | 1200 = 33AD B | 1480 = 6B65 1 | 1760 = B8A2 5 | 2040 = 3DA5 0
  90 = 348C B | 370 = 89D8 3 | 650 = DA12 7 | 930 = E368 3 | 1210 = 33AD 4 | 1490 = 3E6A 7 | 1770 = D863 5 | 2050 = 908C 0
 100 = DEAF F | 380 = 5722 F | 660 = 4FF9 E | 940 = 247A F | 1220 = 33AD 2 | 1500 = 68AF 7 | 1780 = B8A2 A | 2060 = C381 0
 110 = 304E 8 | 390 = 250C C | 670 = 13B2 9 | 950 = 51AC 8 | 1230 = 33AD 1 | 1510 = 6D2E 9 | 1790 = D863 3 | 2070 = D453 C
 120 = 7026 5 | 400 = B26D 3 | 680 = 5147 B | 960 = F735 3 | 1240 = 9E9D 8 | 1520 = 2B36 E | 1800 = A471 D | 2080 = 1464 F
 130 = 5CA1 D | 410 = D251 C | 690 = 59BF A | 970 = B5FC 7 | 1250 = 6E5C B | 1530 = 580E D | 1810 = 5FEC 4 | 2090 = CE17 A
 140 = 9719 1 | 420 = B3B3 F | 700 = 5BD1 9 | 980 = F73B 3 | 1260 = 6E71 C | 1540 = D93A A | 1820 = A471 6 | 2100 = 8A8C 2
 150 = 81D1 A | 430 = 6EBD 9 | 710 = C397 5 | 990 = 16A0 E | 1270 = C366 8 | 1550 = F4E8 D | 1830 = 5FEC 4 | 2110 = BAB5 3
 160 = 17C9 B | 440 = 5422 C | 720 = D7FA E | 1000 =  4DD 2 | 1280 = 25CB 1 | 1560 = 6951 D | 1840 = F783 5 | 2120 = 583D 2
 170 = 5B58 7 | 450 = E9C0 C | 730 = 2253 2 | 1010 = 9B12 9 | 1290 =  6E4 C | 1570 = 4776 E | 1850 = 28C5 D | 2130 = 9528 E
 180 = 9719 C | 460 = F103 0 | 740 = E3A4 D | 1020 = 4E02 2 | 1300 = C0C7 5 | 1580 = 5F28 3 | 1860 = 65D6 D | 2140 = 3EB5 0
 190 = C076 A | 470 = 5FBC 4 | 750 = 68B9 B | 1030 =    D D | 1310 = 2B71 D | 1590 = E46C 8 | 1870 = 874F 9 | 2150 = 4334 9
 200 = 3838 7 | 480 = 9389 2 | 760 = 6FC9 C | 1040 = E30B 4 | 1320 = A19B 3 | 1600 = 936C 2 | 1880 = 41B6 9 | 2160 = F83B 2
 210 = B2B0 1 | 490 = 3045 9 | 770 = 9154 D | 1050 = 72BC A | 1330 = 8386 9 | 1610 = D4BC 4 | 1890 = 335E A | 2170 = 6810 C
 220 = 9719 8 | 500 = 2F0D C | 780 = E387 D | 1060 = 1A7A 1 | 1340 = 812A 7 | 1620 = 6A27 A | 1900 = 471F 8 | 2180 =  210 F
 230 = 1C1B 2 | 510 = AAF6 5 | 790 = 9BBB C | 1070 = 7C11 9 | 1350 = A6B9 9 | 1630 = B06C C | 1910 = ADF7 4 | 2190 = 7763 A
 240 = AE04 B | 520 = CAA7 4 | 800 = 9F4D B | 1080 = FD75 4 | 1360 = DD39 1 | 1640 = E2FE 4 | 1920 = EAB9 5 | 2200 = 12FA C
 250 = BB63 B | 530 = 1BC3 4 | 810 = A336 F | 1090 = F32C D | 1370 = F413 9 | 1650 = 7844 7 | 1930 = 5104 C | 2210 = 6099 1
 260 = 4905 C | 540 = 8033 F | 820 = 7893 2 | 1100 = 4035 C | 1380 = E7BC C | 1660 = 71CD A | 1940 = 1F25 2 | 2220 = 1DEC E
 270 = 7811 F | 550 = 4938 9 | 830 = D4B8 4 | 1110 = B40E 8 | 1390 = FD11 A | 1670 = 4959 F | 1950 = 5A3F 4 |
 280 = 10E4 8 | 560 = 5531 6 | 840 = 70AC F | 1120 = A002 6 | 1400 = 8F86 A | 1680 = 4521 0 | 1960 = 6AE4 A |
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Listing III

```
   10 REM Blue - Listing III
   20 REM by Mike Goldberg
   30 REM (c) The Micro User
   40 MODE7
   50 *LOAD ACode4 3E00
   60 *LOAD 33ikons 4A00
   70 PROCenv:PROCrows
   80 PAGE=&1100:CHAIN"MEANIE"
   90 DEFPROCrows
  100 FORI%=&4100 TO &455E STEP2
  110 READN%:VDU46:IFN%>-1from%=&5020
  120 IFN%<0N%=ABS(N%):from%=&49E0
  130 !I%=from%+N%*&40:NEXT
  140 ENDPROC
  150 DATA1,1,3,6,1,1,13,0
  160 DATA1,2,15,5,1,15,15,2
  170 DATA1,3,1,1,1,3,6,1
  180 DATA1,1,8,14,14,5,14,14
  190 DATA4,1,15,15,1,1,15,14
  200 DATA1,13,1,4,1,1,1,1
  210 DATA1,1,1,1,1,4,1,1
  220 DATA1,1,7,1,1,7,1,1
  230 DATA1,1,10,10,1,1,1,1
  240 DATA3,10,14,2,6,7,15,3
  250 DATA10,7,13,6,3,3,2,1
  260 DATA6,15,2,2,7,2,5,7
  270 DATA1,1,13,14,14,14,15,14
  280 DATA13,2,7,14,15,8,10,3
  290 DATA2,3,2,2,6,1,7,10
  300 DATA2,1,1,1,10,3,2,15
  310 DATA0,15,6,15,2,1,1,5
  320 DATA7,14,14,8,1,6,7,14
  330 DATA3,6,1,3,8,8,3,2
  340 DATA13,13,13,13,13,13,13,13
  350 DATA13,8,13,13,13,13,8,13
  360 DATA10,10,10,10,1,10,10,10
  370 DATA5,5,2,2,5,5,2,2
  380 DATA6,6,6,6,6,6,6,6
  390 DATA10,10,13,10,10,15,10,10
  400 DATA7,6,10,10,2,2,2,2
  410 DATA5,1,3,5,5,3,1,5
  420 DATA14,13,1,15,8,3,3,3
  430 DATA7,7,2,0,0,2,7,7
  440 DATA13,13,13,6,6,13,13,13
  450 DATA1,3,15,15,15,15,3,1
  460 DATA1,2,15,15,15,15,2,1
  470 DATA8,10,2,2,2,1,2,2
  480 DATA5,5,10,10,2,3,5,5
  490 DATA8,8,8,14,13,8,8,8
  500 DATA1,2,3,5,6,7,8,10
  510 DATA10,8,7,6,5,3,2,1
  520 DATA10,6,7,7,7,7,6,10
  530 DATA13,1,14,15,15,13,6,1
  540 DATA1,1,1,5,5,1,14,1
  550 DATA15,13,13,14,3,1,1,13
  560 DATA-1,-1,-1,-1,-1,-1,-1,-1
  570 DATA-1,-1,23,22,22,23,-1,-1
  580 DATA-1,-1,22,-1,-1,22,-1,-1
  590 DATA-2,-2,-2,-2,-2,-2,-2,-2
  600 DATA-2,-2,23,23,23,23,-2,-2
  610 DATA-2,-2,22,-2,-2,22,-2,-2
  620 DATA-2,-2,23,22,22,23,-2,-2
  630 DATA-3,-3,-3,-3,-3,-3,-3,-3
  640 DATA-3,-3,22,23,23,22,-3,-3
  650 DATA-3,-3,23,0,0,23,-3,-3
  660 DATA-3,-3,-3,22,22,-3,-3,-3
  670 DATA-4,-4,-4,-4,-4,-4,-4,-4
  680 DATA-4,-4,24,0,0,24,-4,-4
  690 DATA-4,-4,23,0,0,23,-4,-4
  700 DATA-4,-4,24,24,24,24,-4,-4
  710 DATA-5,-5,-5,-5,-5,-5,-5,-5
  720 DATA-5,24,24,24,24,24,24,-5
  730 DATA-5,24,0,0,0,0,24,-5
  740 DATA-5,24,0,23,23,0,24,-5
  750 DATA-5,-5,23,0,0,23,-5,-5
  760 DATA-6,-6,-6,-6,-6,-6,-6,-6
  770 DATA-6,-6,24,24,24,24,-6,-6
  780 DATA-6,-6,24,-6,-6,24,-6,-6
  790 DATA-6,-6,23,-6,-6,23,-6,-6
  800 DATA-6,-6,23,24,24,23,-6,-6
  810 DATA-6,-6,-6,24,24,-6,-6,-6
  820 DATA-6,-6,-6,23,23,-6,-6,-6
  830 DATA-7,-8,-7,-8,-7,-8,-7,-8
  840 DATA-8,-7,-8,-7,-8,-7,-8,-7
  850 DEF PROCenv
  860 ENVELOPE1,1,1,-2,1,5,18,8,126,-1,-
1,-8,120,90
  870 ENVELOPE2,1,30,10,-1,3,13,3,120,-1
,-1,-3,120,10
  880 ENVELOPE3,1,-1,0,0,3,3,0,126,-2,-2
,-2,120,120
  890 ENVELOPE4,3,-2,2,0,7,18,20,126,-1,
-2,-4,120,100
  900 ENVELOPE5,130,12,1,-1,12,2,60,126,
-1,-3,-3,120,110
  910 ENVELOPE6,1,-2,-10,0,8,18,8,126,-1
,-4,-4,120,120
  920 ENVELOPE7,2,-1,1,-1,5,5,2,12,-1,-4
,-5,126,100
  930 ENVELOPE8,129,90,-90,90,50,50,50,1
26,-1,-3,-3,120,120
  940 ENVELOPE9,1,-1,2,-1,5,5,5,126,-1,-
3,-3,120,120
  950 ENVELOPE10,8,-4,20,-4,10,1,15,126,
-1,-1,-1,120,120
  960 ENDPROC
```

Get it right ✓

```
 10 =    0 0
 20 =    0 0
 30 =    0 0
 40 = 8AFC C
 50 = B716 A
 60 = 22EC 4
 70 = 491D A
 80 = AAC9 0
 90 = 565F 2
100 = A1F7 A
110 = 16B7 E
120 = A688 9
130 = C26F E
140 = ED0F C
150 = 13CF A
160 = 61E1 3
170 = 97FA 0
180 = 6951 E
190 = 807D 5
200 = 7F57 3
210 = FF78 2
220 = E05E 0
230 = 4821 9
240 = 6C12 B
250 = BD8C F
260 = 4920 7
270 = 5556 C
280 = D68F 0
290 = 59FC 0
300 = 57A9 6
310 = B7EA C
320 = EEDD 0
330 = 402A B
340 = DF4A 1
350 = BD27 D
360 = 2FD9 D
370 = 367D 2
380 = 7D41 C
390 = 6FD2 F
400 =  D99 A
410 = BE00 6
420 = ED42 6
430 = 9223 B
440 = 36A6 6
450 = F1BC C
460 = D66E 8
470 = 9A90 2
480 = 905E 3
490 = CFAB 7
500 = 8C50 A
510 =  90B 5
520 = 60C5 7
530 = 751F A
540 = 3E36 5
550 = 7424 F
560 = F457 3
570 = 26EA C
580 = CB51 1
590 = D525 E
600 = 631B 3
610 = DAEC 7
620 = 493D 5
630 = 3A14 6
640 = A60C 9
650 = 792F 5
660 = 93A6 7
670 = 97C1 C
680 = CB10 B
690 = A252 A
700 = 1B9C A
710 = 78F0 E
720 = 5935 3
730 = 7853 7
740 = FC78 0
750 = E196 C
760 = 5982 5
770 = A119 0
780 = 76C1 B
790 =  71A 5
800 = D0C2 7
810 = 8E5A 8
820 = 58A8 4
830 = A6C6 3
840 =  27C 0
850 = D689 9
860 = 7774 8
870 = 5F23 1
880 = B44B D
890 = E026 2
900 = 2888 7
910 = 385F 2
920 = 7D84 2
930 = 2DB6 A
940 = 5483 F
950 = 8828 D
960 = ED0F 2
```

All program listings in this issue can be downloaded FREE on...
MicroLink

Listing IV

```
   10 REM Meanie _ Listing IV
   20 REM by Mike Goldberg
   30 REM (c) The Micro User
   40 DIMn%(14),d%(14),V%(7),I%(7),Q%(1)
,D%(1),M%(7)
   50 FORI%=1TO14:READn%(I%),d%(I%):NEXT
   60 DATA45,2,49,2,45,2,49,2,53,2,57,2,
41,2,49,2,57,2,61,4,41,1,49,1,57,1,61,4
   70 FORI%=0TO7:READV%(I%),I%(I%):NEXT
   80 DATA27,&52C0,96,&5300,58,&5400,36,
&5440,133,&5480,206,&54C0,139,&5500,205,
&5540
   90 Q%(0)=0:Q%(1)=&00200020:Z%=0
  100 D%(0)=15:D%(1)=0
  110 MODE5:VDU23;8202;0;0;0;
  120 REPEAT
  130 COLOUR131:CLS
  140 VDU28,0,31,19,2
  150 COLOUR129:CLS
  160 VDU24,40;16;1168;896;:GCOL0,128:CL
G
  170 VDU28,1,30,18,3
  180 COLOUR131:CLS
  190 VDU28,2,29,17,4
  200 COLOUR128:CLS
  210 PROCinit
  220 RESTORErest%
  230 scr%=29:READE%:PROCscroll(29)
  240 X%=&7980:!&74=X%:?&76=4:z%=0:!&77=
M%(z%):CALLB%:F%=28:G%=0:t%=0
  250 pos%=X%:f%=F%:g%=G%
  260 REPEAT
  270 PROCstart
  280 REPEAT
  290 PROCkeys
  300 FORT=1TO40:NEXT
  310 PROCtime
  320 UNTILt%=sec%ORX%=exit%ORliv%=0ORss
%=1ORexit%=iX%:IFss%=1PROCdie:ss%=0
  330 IFt%=sec%PROCdie
  340 IFX%=exit%:PROCtune1:rest%=rest%+1
0:lev%=lev%+1:RESTORErest%:READE%:PROCsc
roll(29):PROCvdus
  350 pos%=X%:f%=F%:g%=G%
  360 IFexit%=iX%PROCend
  370 UNTILliv%=0ORexit%=iX%
  380 IFliv%=0SOUND1,10,100,1:SOUND2,10,
99,1:PRINTTAB(6,15)"GameOver":REPEATUNTI
LGET=32
  390 COLOUR128:CLS
  400 UNTIL0
  410 END
  420 DEFPROCdraw
  430 IFZ%=0READN%:N%=N%*&10
  440 FORI%=0TO12STEP4:I%!&4000=I%!(C%+N
%)-Q%(Z%):NEXT:VDU30,11:CALLA%:Z%=(Z%+1)
MOD2
  450 ENDPROC
```

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```
  460 DEFPROCinit
  470 data%=2560
  480 data2%=2500
  490 lo%=0
  500 ss%=0
  510 lev%=1
  520 rest%=((lev%-1)*10)+data%
  530 liv%=3
  540 data3%=2490
  550 sm%=&5640
  560 st%=&5830
  570 sec%=60
  580 A%=&3E00
  590 B%=A%+3
  591 C%=&4100
  610 D%=B%+3
  620 end%=D%+3
  630 E%=26
  640 FORI%=0TO7:M%(I%)=&4F80-(I%*&80):N
EXT
  650 VDU20,19,3,4;0;
  660 col%=data2%
  670 ENDPROC
  680 DEFPROCstart
  690 *FX15
  700 VDU26
  710 COLOUR2:COLOUR131
  720 IFlev%MOD5=0sec%=30ELSEsec%=60
  730 PRINTTAB(0,0);sec%
  740 COLOUR0:COLOUR130:PRINTTAB(5,0)"Li
ves=";:COLOUR128:COLOUR1:PRINT;liv%:COLO
UR129
  750 COLOUR2:PRINTTAB(14,0)"Lvl=";:COLO
UR128:PRINT;lev%
  760 COLOUR131
  770 TIME=0
  780 ENDPROC
  790 DEFPROCkeys
  800 IFINKEY-98PROCM(-8,-8,0,-1)
  810 IFINKEY-67PROCM(8,32,2,1)
  820 IFINKEY-73PROCm(-320,-320,6,1)
  830 IFINKEY-105PROCm(320,1280,4,-1)
  840 IFINKEY-51ss%=1
  850 ENDPROC
  860 DEFPROCM(x%,y%,a%,b%)
  870 IF(G%MOD2)>0ENDPROC
  880 IF(X%?y%)>0PROChitLR:ENDPROC
  890 IF(y%?(X%+640))>0PROChitLR:ENDPROC
  900 F%=F%+b%
  910 !&74=X%:?&76=4:CALLD%:X%=X%+x%:!&7
4=X%:?&76=4:z%=(z%+1)MOD2+a%:!&77=M%(z%)
:CALLB%
  920 ENDPROC
  930 DEFPROCm(x%,y%,a%,b%)
  940 IF(F%MOD4)>0ENDPROC
  950 IF(X%?y%)=iH%PROCgot:GOTO970
  960 IF(X%?y%)>0PROChitUD:ENDPROC
  970 G%=G%+b%
  980 !&74=X%:?&76=4:CALLD%:X%=X%+x%:!&7
4=X%:?&76=4:z%=(z%+1)MOD2+a%:!&77=M%(z%)
:CALLB%
  990 ENDPROC
 1000 DEFPROCscroll(scr%)
 1010 VDU28,2,scr%,17,4
 1020 FORT%=1TOE%
 1030 X%=X%+320
 1040 PROCdraw
 1050 NEXT
 1060 READexit%:FORI%=0TO24STEP8:exit%?I
%=255:NEXT
 1070 item%=I%(lo%):iH%=V%(lo%):lo%=(lo%
+1)MOD8:READiX%
 1080 PROCitem
 1090 ENDPROC
 1100 DEFPROChitUD
 1110 IF(X%?y%)=232AND(X%?-960)<>255AND(
X%?-960)<>iH%SOUND1,1,22,1:PROCslide(X%-
640,X%-960,-320,&50C0):ENDPROC
 1120 IF(X%?y%)=143AND(X%?-960)=0SOUND1,
8,145,1:PROCslide(X%-640,X%-960,-320,&51
80):ENDPROC
 1130 IF(X%?y%)=122AND(X%?1920)=0SOUND1,
8,145,1:PROCslide(X%+1280,X%+1600,320,&5
180):ENDPROC
 1140 IF(X%?y%)=188AND(X%?-960)<>255SOUN
D1,5,80,1:PROCslide(X%-640,X%-960,-320,&
51C0):PROCslide(X%-1280,X%-960,320,&5000
+(&40*RND(3))):ENDPROC
 1150 IF(X%?y%)=203AND(X%?1920)<>255SOUN
D1,5,80,1:PROCslide(X%+1280,X%+1600,320,
&51C0):PROCslide(X%+1920,X%+1600,-320,&5
100+(&40*RND(2))):ENDPROC
 1160 IF(X%?y%)=16AND(X%?1920)<>255SOUND
1,6,60,1:PROCslide(X%+1280,X%+1600,320,&
5280):ENDPROC
 1170 IF(X%?y%)=163AND(X%?-960)=163SOUND
1,-12,200,1:PROCslide(X%-640,X%-960,-320
,&5580):ENDPROC
 1180 IF(X%?y%)=248AND(X%?1920)=0SOUND1,
-12,180,1:PROCslide(X%+1280,X%+1600,320,
&5580):ENDPROC
 1190 IF(X%?y%)=32AND(X%?-960)=0SOUND1,-
12,200,1:PROCslide(X%-640,X%-960,-320,&5
5C0):ENDPROC
 1200 IF(X%?y%)=38AND(X%?1920)=0SOUND1,-
12,180,1:PROCslide(X%+1280,X%+1600,320,&
55C0):ENDPROC
 1210 IF(X%?y%)=19AND(X%?-960)=32AND(X%?
-1312)=0SOUND2,-12,150,1:PROCslide(X%-12
80,X%-1304,-8,&55C0):SOUND2,-12,170,1:PR
OCslide(X%-640,X%-960,-320,&5600):ENDPRO
C
 1220 IF(X%?y%)=19AND(X%?-960)=19AND(X%?
-1248)=0SOUND2,-12,150,1:PROCslide(X%-12
80,X%-1256,8,&5600):SOUND2,-12,170,1:PRO
Cslide(X%-640,X%-960,-320,&5600):ENDPROC
 1230 IF(X%?y%)=100AND(X%?1920)=38AND(X%
?1952)=0SOUND2,-12,170,1:PROCslide(X%+19
20,X%+1944,8,&55C0):SOUND2,-12,190,1:PRO
Cslide(X%+1280,X%+1600,320,&5600):ENDPRO
C
 1240 IF(X%?y%)=100AND(X%?1920)=100AND(X
%?1888)=0SOUND2,-12,170,1:PROCslide(X%+1
920,X%+1896,-8,&5600):SOUND2,-12,190,1:P
ROCslide(X%+1280,X%+1600,320,&5600):ENDP
ROC
 1250 IF(X%?y%)=19AND(X%?-960)=0SOUND2,-
12,150,1:PROCslide(X%-640,X%-960,-320,&5
600):ENDPROC
 1260 IF(X%?y%)=100AND(X%?1920)=0SOUND2,
-12,150,1:PROCslide(X%+1280,X%+1600,320,
&5600):ENDPROC
 1270 ENDPROC
 1280 DEFPROChitLR
 1290 IF(X%?y%)=14AND(X%?64)<>255SOUND1,
3,150,1:PROCslide(X%+32,X%+56,8,&5080):E
NDPROC
 1300 IF(X%?y%)=7AND(X%?-40)<>255SOUND1,
3,150,1:PROCslide(X%-32,X%-56,-8,&5080):
ENDPROC
 1310 IF(X%?y%)=122AND(X%?64)=0SOUND1,8,
145,1:PROCslide(X%+32,X%+56,8,&5180):END
PROC
 1320 IF(X%?y%)=229AND(X%?-40)=0SOUND1,8
,145,1:PROCslide(X%-32,X%-56,-8,&5180):E
NDPROC
 1330 IF(X%?y%)=2AND(X%?64)<>255SOUND1,4
,202,1:PROCslide(X%+32,X%+56,8,&5240):PR
OCchange:ENDPROC
 1340 IF(X%?y%)=4AND(X%?-40)<>255SOUND1,
4,202,1:PROCslide(X%-32,X%-56,-8,&5240):
PROCchange:ENDPROC
 1350 IF(X%?y%)=224AND(X%?-40)=224SOUND1
,-12,200,1:PROCslide(X%-32,X%-56,-8,&558
0):ENDPROC
 1360 IF(X%?y%)=248AND(X%?64)=0SOUND1,-1
2,130,1:PROCslide(X%+32,X%+56,8,&5580):E
NDPROC
 1370 IF(X%?y%)=70AND(X%?-40)=0SOUND1,-1
2,200,1:PROCslide(X%-32,X%-56,-8,&55C0):
ENDPROC
 1380 IF(X%?y%)=38AND(X%?64)=0SOUND1,-12
,130,1:PROCslide(X%+32,X%+56,8,&55C0):EN
DPROC
 1390 IF(X%?y%)=98AND(X%?-40)=0SOUND2,-1
2,150,1:PROCslide(X%-32,X%-56,-8,&5600):
ENDPROC
 1400 IF(X%?y%)=100AND(X%?64)=0SOUND2,-1
2,150,1:PROCslide(X%+32,X%+56,8,&5600):E
NDPROC
 1410 ENDPROC
 1420 DEFPROCslide(k%,l%,m%,n%)
 1430 FORJ%=k%TOl%STEPm%
 1440 !&74=J%:?&76=2:!&77=&5000:CALLB%
 1450 !&74=J%+m%:?&76=2:!&77=n%:CALLB%
 1460 FORT=1TO60:NEXT
 1470 NEXT
 1480 IFJ%=exit%SOUND1,9,220,1:!&74=J%:?
&76=2:!&77=&5100:CALLB%:ENDPROC
 1490 IFABS(m%)=8ENDPROC
 1500 IFn%=&5180PROCattract(J%)
 1510 ENDPROC
 1520 DEFPROCattract(J%)
 1530 u%=J%:v%=J%
 1540 uok%=0:vok%=0:stop%=0
 1550 REPEAT
 1560 IFuok%=0u%=u%-32
 1570 IFvok%=0v%=v%+32
 1580 IF?u%=255uok%=1
 1590 IF?v%=255vok%=1
 1600 IF?u%=120stop%=1
 1610 IF?v%=120stop%=2
 1620 IFu%=exit%uok%=1
 1630 IFv%=exit%vok%=1
 1640 UNTILuok%=1ANDvok%=1ORstop%>0
 1650 IFstop%=1ANDu%+32=exit%ENDPROC
 1660 IFstop%=2ANDv%-32=exit%ENDPROC
 1670 IFstop%=1SOUND2,7,12,10:PROCslide(
u%,J%-8,8,&50C0)
 1680 IFstop%=2SOUND2,7,12,10:PROCslide(
v%,J%+8,-8,&50C0)
 1690 ENDPROC
 1700 DEFPROCchange
 1710 FORI%=0TO224STEP32
 1720 FORK%=&5D20TO&7B20STEP640
 1730 IFK%?I%=120!&74=K%+I%:?&76=2:!&77=
&5080:CALLB%:GOTO1750
 1740 IFK%?I%=14!&74=K%+I%:?&76=2:!&77=&
50C0:CALLB%
 1750 NEXT:NEXT
 1760 ENDPROC
 1770 DEFPROCdie
 1780 SOUND0,-15,7,20:SOUND1,7,100,20:SO
UND0,-15,7,30:SOUND1,6,200,30
 1790 GCOL0,0:LOCALx%,y%
 1800 y%=(X%-&5800)DIV320
 1810 x%=(X%-(y%*320)-&5800)DIV16
 1820 IFX%DIV8MOD2=1x%=x%*64+32ELSEx%=x%
*64
 1830 y%=1020-(y%*32)
 1840 FORj%=y%TOy%-124STEP-4
 1850 FORi%=x%TOx%+120STEP8
 1860 IFPOINT(i%,j%)=3PLOT69,i%,j%
 1870 NEXT
 1880 NEXT
 1890 FORT=1TO2000:NEXT
 1900 MOVEx%,y%:PLOT1,120,0:PLOT81,-120,
-124:PLOT81,120,0
 1910 IFlo%>0lo%=lo%-1 ELSE lo%=7
 1920 liv%=liv%-1:IFliv%=0ENDPROC
 1930 RESTORErest%:READE%:IFlev%=1PROCsc
roll(29)ELSEPROCscroll(E%+3)
 1940 X%=pos%
 1950 !&74=X%:?&76=4:z%=0:!&77=M%(z%):CA
LLB%
 1960 F%=f%:G%=g%
 1970 ENDPROC
 1980 DEFPROCtime
 1990 t%=INT(TIME/100):PRINTTAB(0,0);sec
```

➤

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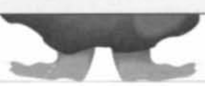
If you prefer to save the wear and tear on your fingers you'll find this listing – together with all the others from this issue – on this month's disc, sent free if you subscribe to *The Micro User.*

```
%-t%;:IFsec%-t%<10PRINT" "
 2000 ENDPROC
 2010 DEFPROCitem
 2020 IFlev%=31ENDPROC
 2030 FORt=1TO6
 2040 SOUND1,-9,200,1
 2050 !&74=iX%:?&76=2:CALLD%
 2060 FORT=1TO280:NEXT
 2070 !&74=iX%:?&76=2:!&77=item%:CALLB%
 2080 FORT=1TO280:NEXT
 2090 NEXT
 2100 ENDPROC
 2110 DEFPROCgot
 2120 SOUND2,2,10,1
 2130 !&74=iX%:?&76=2:CALLD%
 2140 FORI%=0TO24STEP8:exit%?I%=0:NEXT
 2150 FORI%=0TO12STEP4
 2160 I%!st%=I%!sm%
 2170 I%!(st%+320)=I%!(sm%+&10)
 2180 NEXT
 2190 ENDPROC
 2200 DEFPROCvdus
 2210 IFlev%MOD5=0RESTOREcol%:FORI=1TO3:
READA:VDU19,I,A;0;:NEXT:col%=col%+10
 2220 st%=&5830
 2230 GCOL0,3
 2240 FORI%=256TO192STEP-8
 2250 MOVEI%,1012
 2260 PLOT1,0,-40
 2270 NEXT
 2280 ENDPROC
 2290 DEFPROCend:RESTOREdata3%:*FX15
 2300 T=12:P=40:FORI=1TOT:READN1%,D1%,N2
%,D2%,N3%,D3%,W:SOUND1,-15,N1%+P,D1%:SOU
ND2,-15,N2%+P,D2%:SOUND3,-15,N3%+P,D3%:A
=INKEY(W):NEXT
 2310 VDU26
 2320 !&74=X%:?&76=4:CALLD%
 2330 *FX15
 2340 FORI%=&4B80TO&55C0 STEP&20
 2350 !&82=I%:CALLend%
 2360 NEXT
 2370 COLOUR2:COLOUR131:PRINTTAB(2,28)"-
-PRESS SPACE!--"
 2380 REPEAT
 2390 FORI%=&4C00TO&4F80 STEP&80
 2400 !&82=I%:CALLend%
 2410 NEXT
 2420 UNTILINKEY-99
 2430 ENDPROC
 2440 DEFPROCtune1
 2450 FORI%=1TO14
 2460 SOUND1,3,n%(I%)+40,d%(I%)+1
 2470 NEXT
 2480 ENDPROC
 2490 DATA41,2,41,2,41,2,15,57,2,57,2,57
,2,15,69,2,69,2,69,2,15,61,20,77,20,97,2
0,120,49,2,49,2,49,2,15,61,2,61,2,61,2,1
5,77,2,77,2,77,2,15,61,20,73,20,89,20,12
0,41,2,41,2,41,2,15,61,2,61,2,61,2,15,73
,2,73,2,73,2,15,41,30,57,30,89,30,100
 2500 DATA5,2,4
 2510 DATA4,3,1
 2520 DATA1,2,5
 2530 DATA5,3,4
 2540 DATA5,6,4
 2550 DATA1,3,4
 2560 DATA26,7,0,8,3,1,2,3,0,7,2,0,3,4,&
5D20,&6A60
 2570 DATA22,3,0,7,0,2,5,1,8,9,7,0,&6A00
,&5E00
 2580 DATA12,0,3,2,1,0,5,&5D80,&6220
 2590 DATA22,8,20,14,13,15,15,0,14,3,1,6
,&5DC0,&6800
 2600 DATA22,41,41,41,42,43,42,43,42,41,
41,6,&5DC0,&6520
 2610 DATA22,3,2,1,15,12,0,8,5,1,13,1,&6
500,&5FE0
 2620 DATA16,1,2,3,18,15,14,10,5,&5D80,&
6560
 2630 DATA22,7,11,10,16,8,16,11,6,3,20,1
6,&6540,&6500
 2640 DATA16,0,2,2,1,21,0,0,5,&5D80,&600
0
 2650 DATA22,44,44,44,46,47,46,46,45,44,
44,6,&5DC0,&67C0
 2660 DATA22,29,24,1,16,12,33,5,1,32,39,
1,&6780,&5DC0
 2670 DATA14,31,29,34,40,14,31,4,&5D20,&
6C20
 2680 DATA22,12,24,27,15,36,12,32,21,5,3
5,12,&6280,&6040
 2690 DATA18,31,8,39,31,38,29,20,4,26,&5
FA0,&6C60
 2700 DATA20,48,48,49,49,51,51,49,49,48,
5,&5D80,&6500
 2710 DATA22,2,24,31,30,23,4,33,20,20,12
,19,&69A0,&6A80
 2720 DATA12,33,14,37,27,16,4,&5D20,&5DC
0
 2730 DATA22,37,3,3,15,15,21,31,16,16,16
,4,&5D20,&6D00
 2740 DATA22,20,0,15,21,16,9,21,22,22,8,
5,&5D80,&6720
 2750 DATA22,52,52,52,55,54,55,54,55,52,
52,6,&5DC0,&67A0
 2760 DATA22,29,21,31,28,28,31,21,28,20,
21,6,&5DC0,&64C0
 2770 DATA22,31,15,21,20,34,20,8,35,7,36
,4,&5D20,&6500
 2780 DATA22,31,31,31,31,31,3,5,1,16,31,
31,&6780,&6300
 2790 DATA14,15,20,13,22,21,8,5,&5D80,&6
4C0
 2800 DATA22,56,56,57,59,60,58,59,57,56,
56,5,&5D80,&6520
 2810 DATA22,19,31,21,2,28,29,20,7,10,8,
4,&5D20,&6EA0
 2820 DATA22,11,36,3,17,27,13,35,13,27,1
7,5,&5D80,&5E00
 2830 DATA22,8,11,35,7,28,25,9,14,17,7,6
,&5DC0,&5D40
 2840 DATA22,13,20,25,15,20,16,33,24,21,
21,4,&5D20,&6060
 2850 DATA22,61,61,62,66,67,63,65,64,61,
61,6,&5DC0,&6A20
 2860 DATA22,68,69,68,69,68,69,68,69,68,
69,68,&5D20,&5D20
```

Get it right ✓

```
  10 =    0 0 |  370 = C530 2 |  730 = 43A3 5 | 1090 = ED0F B | 1450 = AE13 5 | 1810 =  CCD B | 2170 = E845 2 | 2530 = 513B C
  20 =    0 0 |  380 = 8B81 B |  740 = A002 D | 1100 = FD0E A | 1460 = 536A 7 | 1820 = 758F 4 | 2180 = 2C83 C | 2540 = BACB D
  30 =    0 0 |  390 = C96C 0 |  750 = 8031 1 | 1110 = FA4F 1 | 1470 = 2C83 1 | 1830 = DADA F | 2190 = ED0F B | 2550 = D83D 7
  40 = CBA3 3 |  400 = 53CE 5 |  760 =  573 E | 1120 = DA95 8 | 1480 = 9EB4 9 | 1840 = AEDD 0 | 2200 =  A3D B | 2560 = BE7C 0
  50 = 1ECA D |  410 = FD2E 2 |  770 = 173E 5 | 1130 = C938 2 | 1490 = DC79 A | 1850 = 4FFD 8 | 2210 = D933 9 | 2570 = 3BF7 B
  60 = 2FB2 1 |  420 = 8202 5 |  780 = ED0F 2 | 1140 = 2858 B | 1500 = E9DC D | 1860 = CABD 6 | 2220 = 106C F | 2580 = 28FA 9
  70 = 96C8 3 |  430 = E73E 6 |  790 = 5A41 8 | 1150 = D661 E | 1510 = ED0F 3 | 1870 = 2C83 9 | 2230 = 236D 3 | 2590 =  408 5
  80 = AF32 D |  440 = C90B 3 |  800 = F0BC A | 1160 = 5E5F 3 | 1520 = FCDD 2 | 1880 = 2C83 6 | 2240 = C1B6 3 | 2600 = F25D F
  90 = B266 D |  450 = ED0F 1 |  810 = F2B5 8 | 1170 = 44CA 8 | 1530 = F09F 8 | 1890 = 1912 6 | 2250 = DD75 A | 2610 = E060 6
 100 = BAF8 C |  460 = 344C E |  820 = 3761 A | 1180 = FF73 C | 1540 = A473 7 | 1900 = 6A49 8 | 2260 = DD8D 2 | 2620 = C6FB 4
 110 = AACF 4 |  470 = 6C17 F |  830 = CACB E | 1190 = 6376 F | 1550 = BFBA D | 1910 = 89D7 F | 2270 = 2C83 7 | 2630 = 2DB7 7
 120 = BFBA 8 |  480 = D804 0 |  840 = 8465 E | 1200 = BE1F 6 | 1560 = 3D86 0 | 1920 = AE8B 7 | 2280 = ED0F 8 | 2640 = C05C 7
 130 = 2149 6 |  490 = 3767 B |  850 = ED0F 1 | 1210 = E74C 9 | 1570 = 2422 A | 1930 = F486 2 | 2290 = 8FFD E | 2650 = CB6F B
 140 = 7D78 5 |  500 =  251 4 |  860 = EA79 9 | 1220 = 6859 2 | 1580 = FE96 F | 1940 = FE45 6 | 2300 = 4B46 C | 2660 = 3F25 E
 150 = FE5C E |  510 = 3311 1 |  870 = BBE9 F | 1230 = 7BA4 7 | 1590 = 35E9 1 | 1950 = 82E3 4 | 2310 = B962 E | 2670 = 235C F
 160 = 21EE 2 |  520 = 8BC0 7 |  880 = FC63 B | 1240 = 610F 3 | 1600 = 61AD B | 1960 = CBF8 0 | 2320 = 4F73 8 | 2680 = D688 A
 170 = F4EA 9 |  530 = 9878 2 |  890 = B937 3 | 1250 = CC6A 4 | 1610 = 9E6B 0 | 1970 = ED0F 8 | 2330 = A022 4 | 2690 = C33C 9
 180 = 2149 F |  540 = EDCD 3 |  900 = 38DB 5 | 1260 = 32BE 4 | 1620 = 29DE 5 | 1980 = 5D29 C | 2340 = A11A E | 2700 = 1C74 7
 190 = 75FB E |  550 = F647 C |  910 = 87E9 D | 1270 = ED0F D | 1630 = 6A9D 0 | 1990 = 4DC5 3 | 2350 = B4C9 7 | 2710 = FE2A 3
 200 = C96C 6 |  560 = 106C D |  920 = ED0F C | 1280 = 3612 B | 1640 = 5665 5 | 2000 = ED0F 0 | 2360 = 2C83 6 | 2720 = 8A7C B
 210 = DEBB 4 |  570 = 226B B |  930 = 77B6 6 | 1290 = 89B3 9 | 1650 = B087 0 | 2010 = 769B A | 2370 = 7F3C 0 | 2730 = D54E 2
 220 = D46D C |  580 = 7002 3 |  940 = 31BF 9 | 1300 = 582D 4 | 1660 = 4B04 1 | 2020 = 1121 6 | 2380 = BFBA C | 2740 = 90D0 1
 230 = 315D 7 |  590 = 4FA0 A |  950 = 251D 0 | 1310 = 9284 5 | 1670 = 2E72 1 | 2030 = F793 3 | 2390 = 62FE 9 | 2750 = 3932 4
 240 = A8DF A |  591 = AA41 C |  960 = E570 F | 1320 = AF22 5 | 1680 = B0B0 3 | 2040 = BC49 1 | 2400 = B4C9 0 | 2760 = 887A 6
 250 = 61B0 E |  610 = 7559 6 |  970 = D559 0 | 1330 = 1E97 1 | 1690 = ED0F 2 | 2050 = B37C 5 | 2410 = 2C83 7 | 2770 = 917E F
 260 = BFBA C |  620 = A076 8 |  980 = 87E9 E | 1340 = 9C25 9 | 1700 = A441 8 | 2060 = 6BA1 6 | 2420 =  F23 2 | 2780 = 4611 F
 270 = 9D5F 2 |  630 =  BA2 8 |  990 = ED0F 1 | 1350 = 60A7 2 | 1710 = 8A10 A | 2070 = A70B 3 | 2430 = ED0F 6 | 2790 = 812A 5
 280 = BFBA A |  640 = 259E A | 1000 = 71AD C | 1360 = 2ADA F | 1720 = ABA6 6 | 2080 = 6BA1 8 | 2440 = 89EF B | 2800 = 79CC E
 290 = B0B6 3 |  650 = 721F B | 1010 = 2588 0 | 1370 = 740A 0 | 1730 = AD32 8 | 2090 = 2C83 D | 2450 = 5881 D | 2810 = F8E7 6
 300 = BE02 7 |  660 = 9F4C 5 | 1020 = 437D F | 1380 = A2CE B | 1740 = C84D D | 2100 = ED0F 2 | 2460 = A41C E | 2820 = 8841 9
 310 = B7DE F |  670 = ED0F 8 | 1030 = 13BC 9 | 1390 =  1A9 E | 1750 = 24BD D | 2110 = 5F41 7 | 2470 = 2C83 F | 2830 = 896E C
 320 = 8EA5 2 |  680 = 363B 7 | 1040 = 68F5 D | 1400 = 464E 6 | 1760 = ED0F 0 | 2120 =  7CF 6 | 2480 = ED0F 2 | 2840 = C5C5 3
 330 = 1A73 2 |  690 = A022 1 | 1050 = 2C83 0 | 1410 = ED0F 3 | 1770 = AEA7 4 | 2130 = B37C 3 | 2490 = A153 1 | 2850 = F456 9
 340 = 1A1C 4 |  700 = B962 1 | 1060 =  D22 2 | 1420 = E4F9 D | 1780 = DA81 0 | 2140 = FB60 9 | 2500 = 660B 7 | 2860 = 3639 D
 350 = 61B0 E |  710 = 8F48 3 | 1070 = 2176 0 | 1430 = 3364 2 | 1790 = 69A2 E | 2150 = 1559 F | 2510 = ABCF 4 |
 360 = D768 B |  720 = BC0D 1 | 1080 = 9C6C 2 | 1440 = 22C1 8 | 1800 = 978D 6 | 2160 = 1FF2 C | 2520 = FF2C 2 |
```



When Galileo lost his grip

The lighthearted saga of two micro addicts continues...

Dear Trev

How goes it? Probably in a straight line unless it's acted upon by a force – which is something to do with Newton's Laws of Motion (which, in turn, is nothing to do with sennapods). Speaking of Newton – no, I'm not going to ask you to lend me a quid – is it true that Acorn are going to bring out a successor to the Arc called the Isaac? Maybe it's just the export model with the Hebrew rom.

It's been a hell of a month. It all started when I thought that Doreen had asked me to get physical. After I came round she explained that she'd asked did I know anything about physics? Her school's just introduced the Notional Catastrophe or whatever it is and they're short of science teachers. Apparently they've all gone to work in industry. As cleaners. The money's better.

It seems that the teachers that are left have got to drag IT into everything nowadays – which reminds me of Andrea's constant "Why do you always have to drag IT into everything" (this from a person who wears a "Bell ringers know the ropes" badge). And that was before I got my Beeb. Anyway, Doreen wanted to know if I had any physics software. I didn't but I knew who did. Clive.

You may have noticed that I haven't mentioned Clive, Mr-It-Fell-Off-The-Back-Of-A-Disc-Drive, for a while. It's just that he hasn't been in evidence all that much as he's been working on a program for the lads at Dottybase. It's a text handler which takes. Author's work and. Splits up well-written sentences. So that they break every known rule. Of grammar. It's called house style. Apparently they used to have human beings to do this job but they've all left to become poll tax inspectors – they felt it was an upward move.

Despite his protests – "I can't stop now, I've nearly got it unintelligible" – I dragged him out to the Ram and Buffer, plied him with the last few drops of real Boddards (they've been taken over by Whitless Breweries who do to a pint what Clive's program does to the English language) and after a few jars he consented to come with me to Doreen's house the next night (provided Robert and Marie had been well fed beforehand – and not with red meat).

When I'm round at Doreen's place I always get the feeling that I've stepped into the Rocky Horror Show. First of all we had to get past Marie who asked why was it called Mode 7 when it was the first mode the Beeb woke up in? "Because Acorn designed it", was Clive's inspired reply. "And it's called Mode 0 because no one uses it", he anticipated.

Then came Robert who wanted to know if Mike Cook had a larger soldering iron than other people. "No, it's just he does more with it", I stammered. After this we got to the attic where Doreen keeps her Beeb. It had started off as a Model A but had had so many bits and pieces added to it cannibilised from other micros that now she calls it Frank, short for Frankenstein. Which probably explained the "Don't dream it, Beeb it" badge she was wearing on her "Teachers mark it out of ten" T-shirt.

The first program we looked at dealt with the effects of gravity – "Gee" said Marie who, not realising the gravity of the situation, was unimpressed. It was a simulation of the famous experiment where Galileo dropped his balls off the leaning Tower of Pisa. ("I'm hungry", yelled Robert who kept on about it until D. explained exactly what kind of topping he could expect if he carried on). The idea was that you picked balls of different materials and got Galileo to drop them off the tower simultaneously. They were supposed to land together.

Of course D. and the kids cheated getting the little Galileo figure to drop them off different sides. The most interesting bit was where you could get the program to drop a Beeb and an Electron at the same time – and pick the Nut Abuser writer of your choice to be underneath them. We decided that it was a great program with masses of things to do and lots of weighty decisions for the kids to make.

From that we moved on to a program which simulated static electricity. You know the kind of thing, you rub a glass rod with a silk cloth and it attracts paper and bits of fluff. As Doreen said, the program would have been better if it had stuck to the rod but she could see why the bits of fluff were still attracted and had it been written by Mike Cook?

From here things went downhill. There was one program which demonstrated the magnetic moment of a couple in a field – biology, not physics – and another which used the Laws of Motion to calculate exactly where the fertiliser lands when it's hit the fan. I already knew. Me.

Yours, organically,

Bob

PS: Who was Dot Matrix?

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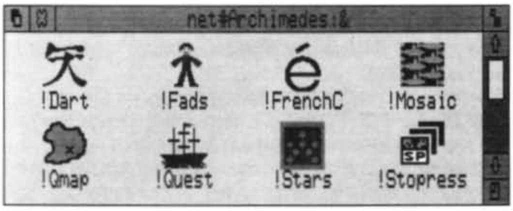

The best-selling BBC Micro software from the Advisory Unit has now been made available for the Archimedes and A3000. The software has been converted to run in native mode, not under emulation, yet every effort has been taken to ensure that it remains as faithful as possible to the BBC versions.

The titles now available for Archimedes are: Stopress £30, Qmap £30, Mosaic £25, Fads £25, Dart £15, Stars £12, Hex £12. A greatly enhanced version of Quest, offering many new features over the BBC Micro version is also available at £30.

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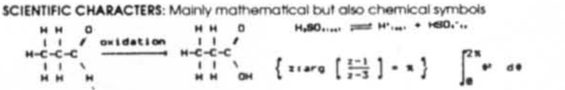

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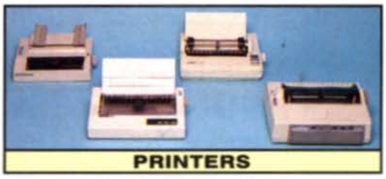
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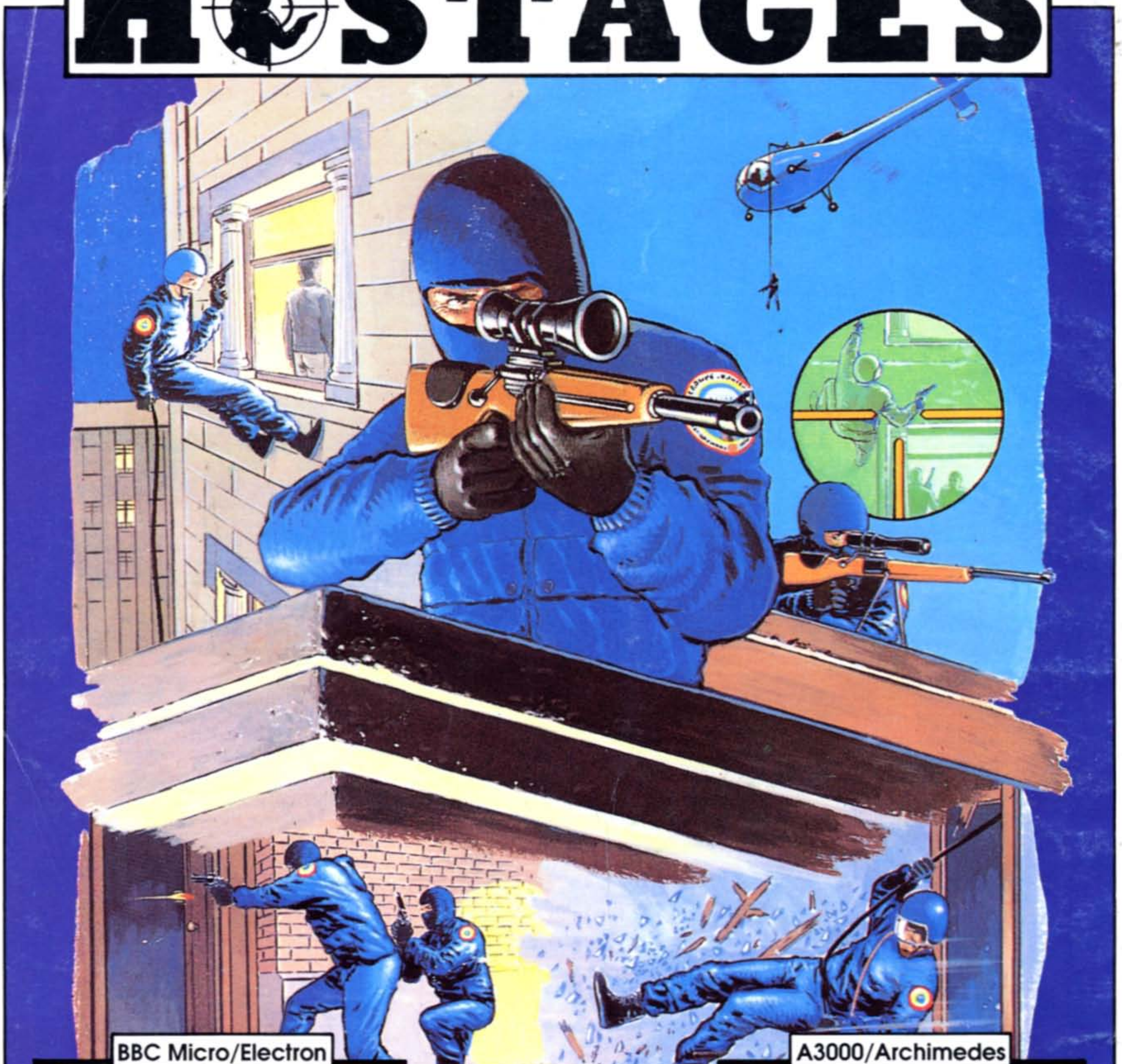

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